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A TEXT OF ASTRONOMICAL OBSERVATIONS IN THE 37TH YEAR OF NEBUCHADNEZZAR II (-567/66)

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MEETING OF THE 1ST MAY 1915.

A text of astronomical observations in the 37th year of Nebuchadnezzar II (-567/66).

By Paul V. Neugebauer and Ernst F. Weidner.

Among the cuneiform texts to be found in the Berlin Museums' Near East Department the tablet VAT 4956 is of foremost importance. It is indeed the oldest known text of astronomical observations written in the detailed style of the late Babylonian Empire. Up until now, that honour had to be given to the British Museum's text 78,11-7,4 from the 7th year of Cambyses, therefore from the year -522/21.[1] Therefore it had already been composed during the reign of the Persian kings. Our new text dates back to the 37th year of Nebuchadnezzar II, therefore from the year -567/66, and is consequently the first major purely astronomical document from the time before the Neo-Babylonian Empire's fall. As far as its contents are concerned, like all later documents of this kind, it describes in great detail observations of the moon, sun and planets, gives details of meteorological and geological phenomena, notes on water levels and the price of food, as well as reports on some interesting happenings at the end of some sections. For all details that, for the most part, are new and of the

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[1] Published by Strassmaier, *Inschriften von Cambyses*, No. 400 and revised by Epping, *Zeitschrift f. Assyriol*. V, p. 281ff. and by Kugler, ibid. XVII, p. 203ff. and *Sternkunde* I, p. 61ff.

greatest interest see the following detailed analysis of the text. We would like to take the opportunity here to express our sincerest gratitude to Privy Counsellor Mr. Delitzsch for graciously allowing publication of the text.[1]

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[1] The original text is to be published in the *Vorderasiatischen Schriftdenkmälern*.

[p. 30, continued]

I. Philological Analysis of the Text.

Transliteration.

Obverse.

1. *šattu 37 $^{m\,il}$Nabû-kudurri-uṣṣur šar Bâbili^{ki} Nisannu 30 Sin ár GÙ-AN ittanmar 14(?) [NA .....*]
2. *^{il}SAG-UŠ ina miḫrit ŠIM 2 ina še-rim TIR-AN ina ŠU iparrik mûšu 3 Sin 2 Ú ina pân* [ ]
3. *SUR mûšu 8(!)[2]) rêš mûši 1 Ú Sin ina pân ^{kakkab}šêpi ár ša UR-A izzaz 9 ina ŠU Šamaš tarba[ṣa ilammi .....*]
4. *lu 12 ^{il}SAG-ME-GAR ana ME-┐-šú illak 14 ilu itti ili ittanmar 4 NA 15 irrup 16 DIL-BAT* [ ]
5. *20 ina še-rim Šamaš tarbaṣa ilammi AN-BIL eli ME zunnu MAL TIR-AN ina NUM iparrik ..* [ ]
6. *ultu 8 ša Adari arkî adi 28 3 Ú 8 SI mûlu illak 2/3 Ú a-na mûli-šu* [ ]
7. *ina a-mat šarri nikê^{pl} arḫi šuâti šêlibu ana ali irrub suâlu (SU-URU) u ri-šú-tú i-za-..* [ ]

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8. *Airu 1 Sin ina Šamaš nazâzi 4 Ú šap ^{kakkab}KÚR arkî ša MAŠ-TAB-GAL ittanmar ka-bar agâ a-pír* [ ]

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1) Der Originaltext soll in den *Vorderasiatischen Schriftdenkmälern* veröffentlicht werden.

2) Text: *9*.

[p. 31]

9. ^{il}*Kaimânu ina mihrit* ŠIM-MAḪ GÙ-UD *ša irabbi lâ in-namar mûšu 1 me-ḫi* KÚR *u* URU ḪI *1 kal ûmu*
[ ]
10. *DIL-BAT ana* ŠU *illak 2* SI ḪI *illak 3* AN *ana Nangari irrub 5 uṣṣi 10* GÙ-UD *ina* ŠU *ár* MAŠ-TAB-
[.... *ittanmar* .....]
11. *15 ṣi*[1])*-ir 18 DIL-BAT e Šarri 1* Ú *4* U LÁL *26 23 Sin lâ ikaššad 27* ... [ ]

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12. *Simânu 30 Sin ár Nangari ittanmar ka-bar 20* NA SI *illak i-nu-šu* AN *u* GÙ-UD *4* Ú *ina pân* Š[*arri*.....]
13. GÙ-UD *šap* AN *šir-tam ittiḳ* SAG-ME-GAR *e Ḫurri* DIL-BAT *ina* ŠU *ana tar-ṣa* ^{iš}*zibbati* UR-A [ ]
14. *1* Ú *mûšu 5 rêš mûši Sin 1* Ú ^{kakkab}SI *ša ḳit šêpi* UR-A *ana* NUM *ittiḳ mûšu 6 rêš mû*[*ši* .....]
15. SIG *mûšu 8 šimêtan 2*$^1/_2$ Ú *Sin šap Zibanîti ša* SI *izzaz mûšû 9 šimêtan 1* Ú *Sin ina pân* [ ]
16. *anu* NUM *it*[*tiḳ*] *9*(!)[2]) *Šamaš izzaz mûšu 10 šimêtan 3*$^1/_2$ Ú *Sin e Ḫurri* LÁL *12* AN *2/3* Ú *e* [ ]
17. [ ] *15 ilu itti ili ittanmar 7 30* NA *atalû Sin ša* LU[3])
[ ]
18. [....*š*]*ap* ^{kakkab}KÚR *ša ḳit š*[*êpi* .....]

. . . . . .

Reverse

. . . . . .

1. [ ] ... *šimê*[*tan* .....]
2. ^{kakkab}MURUB *š*[*a ki-*]*ṣir maḫrû*^{ti} *ša* PA-BIL *1* Ú....[ ]

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1) Zeichen *ZI*. 2) Text: *8*.
3) In Spuren erhalten.

[1] Sign *ZI*. [2] Text: *8*. [3] Preserved in traces.

3. *5 UŠ ûmi NUM ... Šamaš tarbaṣa ilammi 19 DIL-BAT šap-lat* ^{kakkab}*MURUB ša karni MÁŠ 2½ Ú mûšu* [ ]

4. *arḫi šuâti maḫîr še-im 1 GUR 12 ḲA suluppi 1 GUR 60 ḲA ka-si 1 GUR ...* [ ]

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5. *Šabâṭu 30 Sin ina ŠIM-MAḪ ittanmar 14 30 NA SI illak i-nu-šu* ^{il}*SAG-ME-GAR ár ki-ṣir maḫrû*^{ú} *ša PA-B*[*IL ....*]

6. *4 mîlu illak 4 DIL-BAT ½ Ú e*(!)[1] *SUḪUR-MÁŠ LÁL mûšu 6 šimêtan Sin tarbaṣa ilammi* ^{kakkab}*Zappu GÙ-AN Narkabtu ..* [ ]

7. *Sin tarbaṣa ilammi* ^{kakkab}*UR-A u* ^{kakkab}*Nangaru ina libbi ina libbi tarbaṣi Šarru šap Sin 1 Ú LÁL ina namûri 3 UŠ mûši EN*(?) .. [ ]

8. *17* (!)[2] *NA lâ ikaššad Šamaš tarbaṣa ilammi ultu 4 adi 15 1½ Ú mîlu illak 16 imaṭṭi mûšu 18 18 ziunnu MAL LU* [ ]

9. *ša* ^{il}*Bêl ina* (*TA*) *irṣiti râbi ki-i UR-IDIM illak 2 ina* (*TA*) *elippê*^{pl} *ša ḳanî maḫ-ri SUD 22 irûb*^{ub} *mûšu 23* [ ]

10. *šap*[3]) *kakkabi ṣiḫri ša 3½ Ú ár SUḪUR ša MÁŠ izzazu LÁL mûšu 29 a-kú-kú-*(*kú-*)*tum ina ŠU inappaḫ 2 bê*[*ru .....*]

11. *šei ana 1 GUR tâ'iri suluppi 1 GUR 60 ḲA ka-si 1 GUR 36 ḲA šamaššammi 24 ḲA MAL*(?) ... [ ]

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12. *Adaru 1 Sin ina Šamaš nazâzi arkat* ^{kakkab}*KU-MAL ittanmar 25 NA MUŠ agâ a-pír SI illak i-nu-šu* ^{il}*SAG-ME-GAR* [ ]

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1) Text: *šap.* 2) Text: 7. 3) Text: *e.*

13. *lu innamarû*^{pl} *1 mîlu illak mûšu 2 šimêtan 4 Ú Sin šap* ^{kakkab}*Zappi LÁL mûšu 3 rêš mûši 2½ Ú* [ ]

14. *ultu 1 adi 5 S SI mîlu illak 6 mîlu imaṭṭi mûšu 7 Sin tarbaṣa ilâmmi* ^{kakkab}*Nangaru u Šarru ina* [ ]

15. *tarbaṣu Nangara UR-A ilammi ana URU ipatti ina libbi tarbaṣi 1 Ú Sin ina pân* $^{ḫi\text{-}bi}$ *izzaz 1 Ú Sin NUM mûšu 10 ši*[*mêtan* .....]

16. *mûšu 11 irrup 11 ina DAR-PA mûšu 12 zunnu I eli ME 12 îlu itti ili ittanmar 1 30 NA eli DAR-PA* [ ]

17. *ina pân riksi ša ŠIM-MAḪ ½ Ú šap DIL-BAT 8 U GÙ-UD ana NUM ittiḳ KI ŠI SI u NUM A 1 U*[*Š*(?) *NA* .....]

18. *6 SI e GÙ-UD 2 3 Ú šap DIL-BAT LÁL ù AN 2/3 Ú šap* ^{kakkab}*KÚR ša* $^{ḫi\text{-}bi}$ *LÁL a-na* [ ]

19. *eli DAR-PA 21 irrup mîlu illak in 20 DIL-BAT u G(Ù-U)D riksa ša ŠIM-MAḪ irrubû*^{pl} *TA* [ ]

20. *ŠA ana DIN MAŠ LU NIN MUT ina ḳît arḫi ana ŠU LAL in 26 GÙ-UD u DIL-BAT ultu riksi ša A-nu-n*[*i-tum uṣṣû*^{pl} .....]

21. *8 U mîlu utarriṣ*^{iš} *arḫi šuâti 26 barbaru ana Bar-sip*^{ki} *irrub 2 kalbê*^{pl} *idâk la uṣṣi idâk*[*û*^{pl}*-šu* .....]

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22. *šattu 38*^{kan} *m* ^{il}*Nabû-kudurri-uṣṣur Nisannu 30 DIR kal MA* [ ]

23. *šattu 37*^{kan} [*m* ^{il}*Nabû-kudurri-uṣṣur*]

Left Edge

[*šattu 37*^{kan} *m* ^{il}*Nabû-ku*]*durri-uṣṣur*

[p. 34]

Translation

Obverse

1. 37th year of Nebuchadnezzar, the king of Babylon. Nisan the 1st (Adar II had 29d) the moon became visible behind the Hyades; visibility lasted for 64m [...].

2. Saturn opposite the southern Fish of the Zodiac. On the morning of the 2nd, a rainbow formed an arc in the west. On the night of the 3rd, the moon 2 cubits in front of [...].

3. ... At the beginning of the night of the 8th, the moon 1 cubit in front of the star at the rear foot of the Lion. On the 9th, the sun was surrounded by a halo in the west.

4. or the 12th Jupiter apparently rose acronychally. On the 14th, the god was visible with the god; 16m passed between sunrise and moonset on the next morning. On the 15th, it was overcast. On the 16th Venus [...].

5. On the morning of the 20th, the sun was surrounded by a halo. Showers (?) from midday until evening. A rainbow formed an arc in the east [...].

6. From the 8th of Adar II to the 29th the water level rose 3 cubits 8 fingers; ⅔ cubit to (?) its water level (?) [...].

7. By order of the king, sacrifices. In this month a fox entered the city. Coughs and ... [...].

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8. On the 1st of Airu (Nisan had 30d), while the sun still stood there, the moon became visible 4 cubits below the western rearward star of the Great Twins; it was wide, wore the tiara [...].

9. Saturn opposite the southern Fish of the Zodiac. Mercury, which had set heliacally, was not visible. On the night of the 1st, a violent (?) storm from the south-east. On the 1st, the whole day [...].

[p. 35]

10. Venus approached the greatest digression in the west. On the 2nd, a violent (?) north wind blew. On the 3rd, Mars entered Praesepe, on the 5th it came out of it again. On the 10th, in the evening Mercury rose behind the [...] Twins [... heliacally ...].

11. On the 15th, snake-like clouds (?). On the 18th, Venus 1 cubit 4 fingers above Regulus. On the 26th (the moon was still) 1h 32m (visible). On the 27th [...].

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12. On the 1st of Sivan (Airu had 29d), the moon became visible behind Cancer; it was wide, 1h 20m was its duration of visibility. A north wind blew. At that time Mars

and Mercury 4 cubits in front of Regulus [...].

13. Mercury moved below Mars further to the east. Jupiter above Antares, Venus in the west opposite the Lion's tail [...].

14. 1 cubit. At the beginning of the night of the 5th the moon overtook by 1 cubit the northern star at the end of the Lion's foot towards the east. At the beginning of the night of the 6th [...].

15. ... In the evening of the night of the 8th, the moon stood 2½ cubits below the northern star of Libra. In the evening of the night of the 9th, the moon 1 cubit in front of [...].

16. it moved toward the east. On the 9th, summer solstice. In the evening of the night of the 10th, the moon was balanced 3½ cubits above Antares. On the 12th, Mars was ⅔ cubit above […].

17. […] On the 15th, the god was seen with the god. 30m time between sunrise and moonset on the next morning. Lunar eclipse, which was omitted […].

18. […] below the western star of the end of the foot […].

……

[p. 36]

Reverse

……

1. In the evening of the night … […].

2. middle star of the front cluster of stars of Sagittarius 1 cubit … […].

3. 20m of the day in the morning(?) … the sun was surrounded by a halo. On the 19th, Venus below the middle star of Capricorn's horn 2½ cubits. In the night […].

4. In this month the price was for 1 GUR 12 ḲA barley, for 1 GUR 60 ḲA dates, for 1 GUR … cassia … [… 1 shekel silver …].

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5. On the 1st of Šebaṭ (Ṭebet had 29d) the moon became visible in the southern Fish of the Zodiac. 58m duration of visibility. A north wind blew. At that time, Jupiter behind the front cluster of stars of Sagittarius […].

6. On the 4th, the water level rose. On the 4th, Venus was balanced ½ cubit above Capricorn. In the evening of the night of the 6th the moon was surrounded by a halo. Pleiades, Hyades β + ζ Tauri [… stood in it …]

7. the moon was surrounded by a halo, Leo and Cancer (stood) within. In the halo, Regulus was balanced 1 cubit below the moon. At dawn 12m of the night … […].

8. 1h 8m time between sunrise and moonset on the next morning. (The moon)

reached (the sun) no (longer). The sun was surrounded by a halo. From the 4th to the 15th the water level rose about 1½ cubits, on the 16th it fell again. On the night of the 18th and on the 18th showers(?) […].

9. of Bel moved over there like a wolf during the earthquake, he ripped away two of the ships made of first-class reeds. On the 22nd, earthquake. On the night of the 23rd […]

[p. 37]

10. was balanced below the little star which stands 3½ cubits behind Capricorn's fishtail. On the night of the 29th red-glowing clouds lit up in the west, 60° [high ... ... In this month the price was]

11. for as little as 1 GUR barley, for 1 GUR 60 ḲA dates, for 1 GUR 36 ḲA cassia, for 24 ḲA sesame … [… 1 shekel silver …].

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12. On the 1st of Adar (Šebaṭ had 30d) the moon became visible behind Aries while the sun still stood there. 1h 40m was the duration of visibility. Snake-like clouds(?). It wore the tiara. A north wind blew. At that time, Jupiter […].

13. were not visible. On the 1st the water level rose. In the evening of the night of the 2nd the moon was balanced 4 cubits below the Pleiades. At the beginning of the night of the 3rd, 2½ cubits […].

14. From the 1st to the 5th the water level rose about 8 fingers, on the 6th the water level sank again. On the night of the 7th the moon was surrounded by a halo, Cancer and Regulus [stood] within […].

15. The halo surrounded Cancer and Leo, it was open towards the south. In the halo the moon stood 1 cubit in front of broken off. The moon 1 cubit towards the east. On the evening of the night of the 10th […].

16. On the night of the 11th it was overcast. On the 11th, towards sunset and in the night of the 12th … rain. Towards the evening of the 12th the god was seen with the god; 6m time between sunrise and moonset on the next morning. Around sunset […].

17. in front of the band of the southern Fish of the Zodiac, ½ cubit below Venus; Mercury stood 8 fingers further to the east … … […]

[p. 38]

18. 6 fingers above Mercury, it was balanced ⅔ cubit below Venus, and Mars was balanced ⅔ cubit below the western star of broken off, towards […].

19. Around sunset on the 22nd it was overcast. The water level rose. Around the 20th Venus and Mercury entered the band of the southern Fish of the Zodiac … […].

20. … … it turned toward the west. Around the 26th Mercury and Venus [came] out of the band of the northern Fish [… …]

21. the water level increased about 8 fingers. On the 26th of this month a leopard(?) entered into Borsippa and killed two dogs. It was impossible to chase him out again, so he was killed […].

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22. 38th year of Nebuchadnezzar. On the 1st of Nisan (Adar had 29d) cloudy the whole … […]

23. 37th year [of Nebuchadnezzar].

Left edge

[37th year of Nebu]chadnezzar.

The existing copy of our observation text doesn't originate from the year -567/66 itself. Rather we are dealing with a much later copy. This is proved firstly by the comment *ḫi-bi* "broken off, worn" (Rev. 15, 18) which occurs twice and by which the scribe wanted to indicate that he was unable to decipher a word on the original copy. Furthermore the signature (Rev. 2) has to be pointed out, which cites the first line of the following tablet that dealt with the 38th year of Nebuchadnezzar. Our tablet, therefore, belonged to a collection which covered astronomical observations probably over a long period of time and which was likely to serve as material for theoretical astronomical works. Ultimately, the terminology supports the assumption of it being a later copy. It is well-known that the Babylonian astronomers were keen

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to make this ever shorter and more concise. For example, in the late astronomical texts we generally find: *e* for *elat* 'above', *šap* for *šaplat* 'below', *ár* for *arkat* 'behind', *na* for *namurtu* 'visibility', *zib* for *zibbâti* 'tails' (= Zodiac constellation Pisces), *A* for *UR-A* 'Lion', etc. (cf. Kugler, *Sternkunde* I, Plate I). In our text an odd mish-mash of terminology is now conspicuous. Alongside *ár* (Obv. 1, 3, 10, 12; Rev. 5, 10) is *arkat* (Rev. 12), alongside *šap* (Obv. 8, 13, 15, 18; Rev. 3, 6, 7, 13, 17) *šaplat* (Rev. 3), alongside *ŠIM* (Obv. 2) *ŠIM-MAḪ* (Obv. 9; Rev. 5, 17) etc. While in the late texts a determinative cannot be found anywhere, here we read alongside SAG-ME-GAR (Obv. 13) *ilSAG-ME-GAR* (Obv. 4; Rev. 5, 12), alongside *Nangaru* (Obv. 10, 12) *kakkabNangaru* (Rev. 7, 14). The planet Saturn once bears the older name *ilSAG-UŠ* (Obv. 13), once the later name *ilGIN* (Obv. 9).[1] All this indicates that we are not dealing with the original but with a late copy. The scribe has obviously tried to provide it with the abbreviated terminology commonly used later; in doing so, however, he has not taken the greatest care and, as will be shown later on, it has not been without errors. Yet in terms of content, our version naturally offers a faithful reproduction of the original.

Firstly, there follows a number of detailed philological remarks.

Obv. 1. Here we read: *Nisannu 30*. By this Nisan 1st is meant, where at the same time the note is included that the previous month, the intercalary Adar, had 29d. Nisan 1st completes the 30th day of the cycle.[2] In line 8 we find: *Airu 1st*. That means that Nisan had 30d and that a new cycle began with Airu 1st. This extremely sensible method of implicitly indicating the month lengths was first established by Epping

(*Astronomisches aus Babylon*, p. 15) in astronomical

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[1] S. Meissner, *Seltene assyrische Ideogramme*, No. 2739.

[2] The Babylonians would regularly count the month theoretically as 30^{d}; cf. A. Jeremias, *Handbuch der altorient. Geisteskultur*, p. 76.

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texts of the late period. In *Zeitschrift f. Assyriol.* XXVII, p. 385ff. Weidner proved that it was already in use in the Neo-Assyrian period.

The end of the preserved part of the line gives the duration of new moon crescent visibility after sunset. *NA* is short for *namurtu* 'visibility' (for the complete term cf. Obv. 12; Rev. 5, 12). The duration of visibility here on Nisan 1^{st} comes to 14, i.e. 14 UŠ = 56^{m}. For the equation 1 UŠ = 4^{m} (= 1 degree of arc) see Kugler, *Zeitschrift f. Assyriol.* XV, p. 385f. and Zimmern, *Das Princip unserer Zeit- und Raumteilung*, p. 56; for all the above cf. Epping, *Astronomisches aus Babylon*, p. 43ff.

2. *ina miḫrit* 'opposite' equates to 'standing alongside the constellation' (cf. Muss-Arnolt, *Assyr. Handwörterbuch*, p. 532). On Nisan 1^{st}, Saturn stood approximately at 326° (see p. 72), the constellation *ŠIM* (southern Pisces of the Zodiac) at that time spanned roughly from 305° to 348° (see p. 85).

TIR-AN, in older times *TIR-AN-NA*, is to be read *marratu* in Semitic-Babylonian (see Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 82). That this has to be a rainbow had already been recognised by Thompson, *Reports of the Magicians* II, p. LXXIX. This explanation is also proved by our text[1]; according to Obv. 2, the *TIR-AN* becomes visible in the morning in the west; according to Obv. 8 in the evening in the east. As it is well-known that the rainbow is always opposite the sun, any other interpretation of *TIR-AN* has to be excluded.

ŠU is probably to be read *erêbu* 'setting, west'. Elsewhere the more complete ^{d}*UD-ŠU-A* = *erêb* ^{il}*Šamaši* 'sunset' is found.

The cubit (*Ú* = *ammatu*) is the basis for measurements in the sky. It is subdivided into 24 fingers (*Ú* or (*ŠU-*)*SI* = *ubânu*). The size of the cubit will be discussed in more detail below on p. 78f.

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[1] Also cf. *Zeitschrift f. Assyriol.* VI, p. 237, line 10 and p. 238, line 35.

[p. 41]

3. The text here shows *mûšu 9*. Surely it should be read as *mûšu 8*(!). The ^{kakkab}*šêpu ár ša UR-A* mentioned here has already been firmly fixed by Epping, *Astronomisches aus Babylon*, p. 128 as β Virginis. As calculation proves (see p. 67), the moon stood 1 cubit in front of this star on Nisan 8^{th}, and not on the 9^{th}. We therefore need not hesitate in making the cited emendation in the text. The mistake is easily explained; the scribe had misread the  from the original as  , and changed this to the customary only in the late period. Perhaps also in the second half of the line, *8*(!) *ina ŠU* is to be read instead of *9 ina ŠU.*

rêš mûši 'beginning of the night' describes the time when complete darkness sets in. The twilight after sunset is called *šimêtan* 'evening' (see Obv. 15, 16; Rev. 1, etc.);

also cf. below p. 63f.

The sign  is used here as the ideogram for *kakkabu.* This correspondence was completely unknown before now. It must be mentioned here that the sign is found as a determinative before star names even in numerous unpublished late period astronomical and astrological texts, and particularly those coming from the ruin mounds of Warka.

The end of the line is completed, according to Obv. 5; Rev. 6, etc. The halo with a 22° radius around the sun and moon is meant by *tarbaṣu* (see Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 81f.; Kugler, *Sternkunde* II, p. 99ff.). Halo observations are mentioned quite often in our text. Obv. 3, 5; Rev. 3, 8 report on halos around the sun; Rev. 6, 7, 14, 15 on halos around the moon. The latter are particularly important; indeed, as it is regularly stated which stars and constellations were seen in the halo, an important clue is given for identifying them by approximately fixing the limits.

4. The end of line 3 is to be completed with '11'. The Babylonian astronomer was not able to decide for sure whether Jupiter

[p. 42]

rose apparently acronychally on Nisan 11th or 12th. The calculation proves with certainty (see below p. 72) that *ME-*  means apparent acronychal rising. We have here an expression parallel to *ME-E-A* 'opposition' (see Kugler, *Sternkunde* I, p. 274b). That we are dealing with two similar phenomena is shown by the very fact that both ideograms begin with *ME*, whose meaning, moreover, cannot be established with certainty. Likewise, it cannot be stated with any certainty how *ME-* is to be read in Semitic-Babylonian.

ilu itti ili ittanmar 'the god (moon) was seen with the god (sun)'. Both heavenly bodies are in opposition in the evening: the moon on the eastern horizon, the sun on the western horizon, i.e. it is full moon. This expression has long been known from the astrological texts of Ašurbanipal's library (see Thompson, *Reports* II, p. 139; Virolleaud, *L'Astrologie Chaldéenne, Sin* III, 24, 39, 52, 57, 62, 65, etc.). The parallel expression is also found: *Sin itti Šamaš ittanmar* 'the moon was seen with the sun' (Thompson, loc. cit.; Virolleaud, passim).

4 NA. This statement refers to the morning of Nisan 14th.[1] *NA* is short for *namurtu* 'visibility' (see above p. 39). The text indicates the time of lunar visibility after sunrise here as 4 (UŠ) = 16^{m}. Cf. Epping, *Astronomisches aus Babylon*, p. 61ff.; Kugler, *Sternkunde* I, p. 65.

15 irrup. Ungnad, *Oriental. Literaturztg.* 1912, Col. 449 has shown that *ŠU* is to be understood as *irrup* 'overcast' (from *erêpu*).

5. *šêru* 'morning' describes the beginning of daylight after the sun has fully risen. The dawn (the time of daybreak before sunrise) is called *namâru* ('daybreak'), see p. 53.

AN-BIL is to be read *ḳararû* and, as Weidner has proven in *Babyloniaca* VI, p. 65ff., to be interpreted as midday.

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[1] As is well-known, the Babylonians began their full day in the evening; see A. Jeremias, *Handbuch der altoriental. Geisteskultur*, p. 166.

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ME must have the meaning 'late afternoon' or 'evening' (also cf. Kugler, *Sternkunde* I, Plate 1, No. VII). Not only does the whole time reference clearly suggest this, but this also comes most probably from the immediately following note that a rainbow had become visible in the east. Naturally, that could only have occurred in the evening. How *ME* is to be understood in Semitic-Babylonian cannot be stated with certainty; but perhaps it is better to read *LAL* for it. Also cf. below p. 63f.

For *zunnu MAL* cf. *IM-MAL – ašamšutu* 'storm' (Brünnow, *List*, No. 8433). As *IM-MAL* is probably to be interpreted as 'strong wind (*IM = šâru)',* accordingly *zunnu MAL* would therefore mean 'heavy rain, downpour'.

The interpretation *NUM* = 'morning, east' has long been familiar (see Epping, *Astronomisches aus Babylon*, p. 169). Obv. 13 of our text finally offers us the Semitic reading of the ideogram; it is *šêrtu*. This word is found quite frequently in the astrological inscriptions from Ašurbanipal's library (e.g. Thompson, *Reports* 185, 1; 186, 1; 196, 11; 271, Edge 1; Virolleaud, *L'Astrologie Chaldéenne, Ištar* II, 6, etc.). Until now it has mostly been incorrectly translated as 'shine' (cf. Weidner, *Babyloniaca* VI, p. 85, note; Jastrow, *Religion Babyloniens* II, p. 639, note 2; see also Ungnad-Kohler, *Hammurabis Gesetz* II, p. 174); Kugler, *Sternkunde* II, p. 20, note 3, already gave the correct translation 'morning, east'.[1]

6. Here the first mention about the water level is given. Naturally, it's about the water of the Euphrates. This is supposed to have risen about *3 Ú 8 SI* '3 cubits and 8 fingers' from Adar II 8th to Nisan 28th. *Ú* is a well-known ideogram for *ammatu* 'cubit' and *SI* is short for *ŠU-SI = ubânu* 'finger' (see Kugler, *Sternkunde* I, p. 276b). In Neo-Babylonian times, the Babylonian cubit had a length of 0.495m (see Thureau-Dangin, *Journal asiatique* 1909, p. 98).

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[1] Also cf. Kohler-Ungnad, *Assyrische Rechtsurkunden*, 133, 4; Bezold, *Zeitschrift f. Assyriol.* XXVIII, p. 412

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In the astronomical texts a cubit consists of 24 *ubânê* (see Kugler, *Zeitschr. f. Assyriol.* XV, p. 387; *Sternkunde* I, p. 25). 1 *ubânu* would then be 0.020625m long. The water level increased therefore about 1.65m in the relevant period. The time under consideration is April/May (Adar II 8th = April 1st, Nisan 28th = May 18th). This is the time of the late rains "which give the grain the necessary moisture to survive the dry heat of early summer, without which the harvest consequently fails" (Benzinger, *Hebräische Archäologie*^{2}, p. 22; also cf. H. Auhagen, *Beiträge zur Kenntnis der Landesnatur und der Landwirtschaft Syriens*, p. 6f.). The notes on the water level are then missing for the following period; actually, the end of May sees the beginning of the rainless season which lasts until October. From the present text we can also derive the important fact that the 36th year of Nebuchadnezzar (-568/67) was a leap year with a second Adar; however that was already known from other documents (see Weissbach, *Hilprecht Anniversary Volume*, p. 284).

7. The beginning of this line informs us that king Nebuchadnezzar had ordered sacrifices in this month. On what grounds this happened is not clear. Then we are told that in Nisan a fox had been seen in the 'city' (Babylon[1]). This trivial note has only been recorded here to enable some ominous meaning to be attached to it. It is well known that we possess several extensive texts in the form of chronicles which report a great number of such events (generally concerning animals) which were meaningful to the superstitious Babylonians (see Boissier, *Choix de textes* I, p. 253ff.; *Cuneiform Texts* XIX, pl. 48f.; Jastrow, *Religion Babyloniens* II, p. 965ff.; Frank, *Zeitschrift d. deutschen Morgenländischen Gesellschaft* 1914, p. 157ff.; King, *Chronicles concerning early babyl. kings* II, p. 70ff., 157ff.). Even in the neo- and late Babylonian astronomical texts such notes are often found; cp. e.g. VAT 4924, Obv. 3: *arḫi šuâti šêlibu ina SIL-*

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[1] The simple term *alu* 'city' (*κατ' ἐξοχήν*) for Babylon (cf. 'urbs' for Rome) can be found elsewhere too, e.g. *Babyl. Chronik* III, 22 (*Keilinschr. Bibl.* II, p. 280f.) etc.

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DAGAL-LA ali innamir "in this month (Nisan) a fox was seen on the broad street[1] of the city[2]"; Rev. 9f.: *6 laḫru ûlid-ma la-ḫu-ú lâ irši 7 laḫru ûlid-ma la-ḫu-ú lâ irši* "on the 6th (Adar II) a lamb gave birth and it (the newborn) had no jaws; on the 7th a lamb gave birth and it had no jaws"; Rev. 12: *24 iṣṣûru iḳ-lu-up-ma 3 šêpê^{pl}-šu* "on the 24th (Adar II) a three-legged bird hatched" etc.

The end of line 7 seems to speak of an epidemic which appeared during Nisan in Babylon. It has long been known that *suâlu*, the first of both illnesses mentioned here, means 'cough' (see Küchler, *Beitr. z. assyr.-babyl. Medizin,* p. 65; Meissner, *Göttinger Gelehrte Anzeigen* 1904, p. 740 and *Seltene assyr. Ideogramme*, No. 99; Virolleaud, *L'Astrologie Chaldéenne, Ištar* XXX, 48 and *Adad* VII, 7). On the other hand, it cannot be determined with any certainty whether, among the words well known today, the name of the illness *rišûtu* found here already exists (see Delitzsch, *Handwörterbuch*, p. 629; Muss-Arnolt, *Handwörterbuch* p. 990).

8. *Airu 1.* Nisan therefore had 30^{d} (see above p. 39). On Airu 1st, the moon now became visible 4 cubits below β Gemin., and in fact *ina Šamaš nazâzi* "while the sun still stood in the sky". This addition is also found elsewhere in the late Babylonian astronomical texts, e.g. Rm IV, 397, line 63 (*Zeitschrift f. Assyriol.* VI, p. 240), even more frequently in the astrological texts from Ašurbanipal's library (see Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 69). The fact that the new moon crescent already became visible when the sun was still above the horizon proves that the moment of astronomical new moon already occurred a long time previously, which is also confirmed by calculation (see below p. 68). Also the further addition

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[1] SIL-DAGAL-LA = *sûḳu rapšu* ("broad street") is the name of one of Babylon's main streets (see Weissbach, *Der Alte Orient* V, 4, p. 28).

[2] The simple term *alu* "city" (*κατ' ἐξοχήν*) for Babylon (cf. 'urbs' for Rome) can be found elsewhere too, e.g. *Babyl. Chronik* III, 22 (*Keilinschr. Bibl.* II, p. 280f.) etc.

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ka-bar "the crescent was wide" indicates this.[1] The final note *agâ-apir* "it wore the tiara" means 'earthshine' (see Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 23ff.).

9. In the second half of this line we again find meteorological information. It says there that during the night of Airu 1st a violent south-easterly hurricane had been raging: *me-ḫi* is the well-known word, *meḫû* "hurricane", *KÚR* abbreviation for *IM-KÚR-RA* = ^{šâr}*šadú* "east" and *URU* abbreviation for *IM-URU-LU* = ^{šâr}*šûtú* "south". *ḪI* should have a meaning like "strong" or something similar (cf. *ḪI* = *mâdu*, Brünnow, *List*, No. 8226, etc.). Similar information occurs frequently in the astronomical texts: *IM ḪI* "strong wind" (*Zeitschrift f. Assyriol.* VI, p. 234, line 5, 7; p. 235, line 28; p. 238, line 20; p. 239, line 44, 46, etc.), *MAR ḪI* "strong westerly wind" (ibid. p. 234, line 15), *URU ḪI* "strong southerly wind" (ibid. p. 236, line 2), etc. The detail about the day of Airu 1st is probably to be completed by saying that the whole day was overcast, dark or similar (cf. Rev. 22 of our text, etc.).

10. Venus goes to *ŠU*. One might first assume that here it is talking about a heliacal setting (see Kugler, *Sternkunde* I, p. 278a). However, calculation shows that the planet was an evening star and was positioned just before its greatest elongation from the sun. According to that, *ŠU* would be understood as "the greatest elongation in the west".[2] This meaning of *ŠU* is new.

On Airu 2nd a strong north wind blew. *SI* is short for *IM-SI-DI* = ^{šâr}*iltânu* "north"; moreover, see above comments on line 9.

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[1] *ka-bar* also occurs with this meaning in the astrological texts from Ašurbanipal's library, e.g. Virolleaud, *L'Astrologie Chaldéenne*, 2. Suppl. VIII, 4ff.: *šumma Sin ina tamarti-šu ka-bar KI-MIN ku-ri* "when the moon at its appearance is wide or narrow".

[2] I.e. Venus is an evening star. This specialized meaning is, at the same time, contained in *ŠU* which indeed also means evening (see above, p. 40). Accordingly, "greatest elongation in the east (as a morning star)" would be called *NUM.*

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Mercury rises heliacally on the evening of Airu 10th behind the "Twins". The Babylonians knew three 'Twins' constellations: ^{kakkab}*MAŠ-TAB-BA-GAL-GAL*, "the Great Twins" = α + β Gem., ^{kakkab}*MAŠ-TAB-BA-TUR-TUR*, "the Little Twins" = δ + ζ Gem., ^{kakkab}*MAŠ-TAB-BA ša ina miḫrit* ^{kakkab}*ŠIB-ZI-AN-NA izzazú*^{pl}, "the Twins which stand opposite Orion" = γ + ε Gem. As calculation shows (see below p. 73), we can probably supplement here ^{kakkab}*MAŠ-TAB*-[TUR][1] "little Twins" (δ + ζ Gem.).

11. On the 15th *ṣi-ir*. This is to do with the time of the full moon. However, what is meant by the term *ṣi-ir*? As far as the word itself is concerned, a generally acceptable assumption should probably be that we are here dealing with the phonetic spelling of *MUŠ* = *ṣîru* which quite frequently appears in the astronomical texts[2] and is also found in our text, Rev. 12. Epping and Strassmaier were the first to attempt an interpretation. They pointed out that it only occurs with details about new crescent, full moon and last crescent and in *Zeitschrift. f. Assyriol.* VI, p. 96, therefore presumed: "*zir* (*MUŠ*) can hardly be understood as anything other than the light (at the beginning and end of the month) or the dark (at the time of full moon) strip of the moon." But they must have soon abandoned this view again as, in *Zeitschrift. f. Assyriol.* VII, p. 227, they comment on *MUŠ*: "a meteorological detail?" To determine the exact meaning of *MUŠ*, two things must be considered: 1. *MUŠ* is an ideogram for *ṣîru* "snake"; 2. at the time of new crescent, full moon and last crescent the moon appears near the horizon. Then it would be most likely to take *MUŠ* = *ṣîru* as the

long, trailing bands of cloud lying close to the horizon in the mornings and evenings, and which could quite appropriately be described as

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[1] Not: *MAŠ-TAB[-BA-TUR-TUR]*! Cf. on line 8: *MAŠ-TAB-GAL.*

[2] Cf. e.g. *Zeitschrift f. Assyriol.* VI, p. 233, line 35ff.

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"snakes".[1] Even some especially important passages in the text S † 1949 published by Epping and Strassmaier in *Zeitschrift. f. Assyriol.* VI, p. 231ff. fully match this translation. They read: 1. S † 1949, Rev., Col. 3, line 38 (p. 233): *Ulûlu 1 17 RIM MUŠ ana Šamši išappal* "Elul 1st (Ab had 30^{d}). 1^{h} 8^{m} (the new moon crescent was visible after sunset). (It wore) the ring of light.[2] The 'horizon clouds' stretched down toward the sun"; 2. ibid., Col. 4, line 4: *Šabâṭu 1 19 RIM MUŠ ana Šamši išappal* "Šebaṭ 1st (Ṭebet had 30^{d}). 1^{h} 16^{m} (the new moon crescent was visible after sunset). (It wore) the ring of light. The 'horizon clouds' stretched down toward the sun". In both cases, it appears to mean a wide bank of long, trailing bands of cloud on the horizon which formed between the sun and the new moon crescent. 3. ibid., Col. 2, line 40: *Nisannu 1 20 12 a-na MUŠ illak ittanmar* "Nisan 1st (Adar II had 30^{d}). 1^{h} 20^{m} 48^{s} (the new moon crescent was visible after sunset). It approached the 'horizon clouds' as it appeared"; 4. ibid., Col. 2, line 52: *Simânu 1 26 RIM a-na MUŠ illak ittanmar* "Sivan 1st (Airu had 30^{d}) 1^{h} 44^{m} (the new moon crescent was visible after sunset). (It wore) the ring of light. It approached the 'horizon clouds' as it appeared". In both cases, we're dealing with a long period of crescent visibility. As the astronomical new moon already occurred some time ago, it already stood quite high in the western sky in the evening, hence naturally a considerable distance above the banks of 'horizon clouds' as well. The counterpart to this is given by the following text: 5. ibid., Col. 3, line 44: *Tešrîtu 30 10 Sin šaplat MUŠ* "Tešrit 1st (Elul had 29^{d}). 40^{m} (the new moon crescent was visible after sunset). The moon (stood) below the 'horizon clouds'". The new moon crescent's short period of visibility presupposed its low position above the horizon. The rendering *MUŠ* (*ṣîru*) = 'horizon clouds'

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[1] For the comparision between clouds with animals see also Virolleaud, *L'Astrologie Chaldéenne*, 2. Suppl. CXI, 6ff.

[2] See Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 26f.

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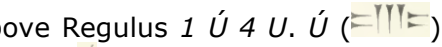
ought to be highly probable according to all these passages.

Venus stood above Regulus *1 Ú 4 U*. *Ú* () = *ammatu* "cubit" has already been discussed above. *U* () is = *ubânu* "finger", but not the abbreviation of it as Kugler (*Sternkunde* I, p. 279a) thinks, but a well-known ideogram (see Brünnow, *List*, No. 8771). *LÁL* is probably understood as *ištaḳal* (or similar) "it (Venus) was in balance with it (Regulus)"[1]. For the meaning of this expression, see below p. 78.

26 23 Sin la ikaššad. This means: on the 26th last crescent visibility was still 23 *UŠ* = 1^{h} 32^{m}; the moon "had not (yet) reached (the sun)", i.e. was not yet setting heliacally. *KÚR* = *kašâdu* "to reach (the sun)", in the sense of heliacal setting, is very common in the late Babylonian astronomical texts (see Kugler, *Sternkunde* I, p. 23), but also occurs in the older astrological texts (e.g. Virolleaud, *L'Astrologie*

Chaldéenne, Sin III 22). The end of the line may well have stated that the moon had set heliacally on Airu 27th; then a possible emendation would be: *27 Si*[*n ikaššad*].

12. *Simânu 30.* Airu thus had 29d. For *ka-bar* see above p. 46; for *NA* p. 39. The detail that the moon had been visible for 1h 20m after sunset is confirmed by calculation.

13. *šêrtu* has already been discussed on p. 43. The phrase: (*ana*) *NUM LU* = *šêrtam* (*ana šêrti*) *etêḳu* "to move further toward the east" is already well-known from the late Babylonian astronomical texts (see Kugler, *Sternkunde* I, p. 276a). For *ana tarṣa* "opposite, in the direction of" see Delitzsch, *Handwörterbuch*, p. 715. It means that the planet Venus, which was near the ecliptic, and the fixed star θ Leonis, which was quite distant from the ecliptic, were almost the same latitude.

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1 Cf. Thompson, *Reports*, Vol. II, p. 131b cited passages under *šaḳâlu.*

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For *iṣzibbat UR-A* = θ Leonis, see Epping-Strassmaier, *Zeitschrift f. Assyriol.* VII, p. 225 and Kugler, *Sternkunde* I, p. 29.

16. Here again we notice a scribal error. Between the night of the 9th and the night of the 10th Sivan is, naturally, the day of the 9th - not the 8th which the text gives. It is clear that the scribe has misread the original  as  . Had he correctly read , incidentally, he would also have changed it to  (see above, p. 41). That the solstices are described by *Šamaš izzaz* "the sun stands (still)" has long been well-known (see Epping, *Astronomisches aus Babylon*, p. 151; Kugler, *Sternkunde* I, p. 274a). Incidentally, the Latin *solstitium* is an exact translation of it.

17. The meaning of *ilu itti ili ittanmar* and of *NA* has already been discussed above on p. 42. The lunar eclipse of Sivan 15th (= -567 July 4) was not visible in Babylon. The Babylonian astronomer had determined this only on the basis of an eclipse period known to him (likely the Saros) and thus written: *atalû Sin* "calculated lunar eclipse".[1] The following is probably to be read: *ša etetiḳ* (*LU*) "which is omitted" (i.e. is invisible in Babylon; see Kugler, *Sternkunde* I, p. 268a). Traces of *ša LU* can almost certainly still be recognized.

18. The supplement suggests itself here: *kakkabKÚR ša ḳît š*[*êpi UR-A*] "the western star from the end of the Lion's foot": cf. line 14!

With that, the obverse of the text breaks off. The rest of the observations for Sivan, all observations for the months Tammuz to Kislev and the beginning of the observations for Ṭebet are missing. Where the reverse begins, we already find ourselves in the second half of the month Ṭebet.

Rev. 2. *kiṣir maḫrû ša PA-BIL* "front *kiṣir* of Sagittarius" named here is mentioned once more in line 5. The calculation

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1 *atalû Sin* "calculated lunar eclipse", *Sin atalû* "observed lunar eclipse", see Kugler, *Zeitschrift f. Assyriol.* XV, p. 181ff.

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shows that it is identical to the cluster of stars near π Sagittarii, which mainly consists of the stars ν_1, ν_2, ξ, *o*, π, 28, 29, 30, 31, 33, 36 Sgr. But what does *kiṣir* mean? There is a Babylonian word *kiṣru* "crowd, heap", that is also used to express "star cluster" as shown by Jensen (*Keilinschr. Bibliothek* VI, 1, p. 431). Since the stars concerned do indeed lie quite close together, this is almost certainly the word here. The "middle star in the front star cluster" named in our line would then have to be ξ Sgr. Incidentally, where is the "rear star cluster of Sagittarius" to be found?

3. Here we find the full form *šap-lat* "below" instead of the customarily used abbreviation *šap* (see above p. 39).

4. Here, for the first time in the preserved part of the text, the rate of grain prices for the previous month is given. Even in the old Babylonian period, the high or low level of prices was viewed as signs of fortunate or unfortunate conditions in the land (cf. Singâšid, Tonnagel, line 15ff.; Thureau-Dangin, *Vorderasiat. Bibliothek* I, p. 222f.[1]. Šamši-Mêr[2] I., stone tablet inscription, Col. III, 16ff.;

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[1] In *Revue d'Assyriologie* VIII, p. 91, n. 3 Thureau-Dangin says, however, that we are here dealing with an ideal state wished for by Singâšid. However, this notion seems to be invalidated in view of the statement in Šamši-Mêr; there we read: *i-nu-ma bît* ^{il}*En-lil be-li-ja e-pu-šú maḫîr a-li-ja A-usar*^{ki} *a-na 1 šiḳil kaspi 2 GUR šei a-na 1 šiḳil kaspi 15 ma-na šipâti a-na 1 šiḳil kaspi 12 ḲA šamni i-na ki-rib a-li-ja A-usar*^{ki} *lu-ú iš-ša-am* "When I was building the temple of my lord Enlil, the rates in my town of Assur were: 1 shekel of silver bought 2 GUR of barley, 1 shekel of silver 15 minas of wool, 1 shekel of silver 12 ḲA of oil in my town of Assur." This is of course a description of the actual condition and the same could be assumed in the case of Singâšid.

[2] This is how to read the weather god's name in the old Assyrian texts – not Adad. Indeed, in an unpublished inscription, a previously unknown Assyrian ruler (c. 1500 B.C.) writes his name: ^{m}*Tukulti*^{ti}*-*^{il}*Me-ir*. The reading Adad for the ideogram ^{d}*IM* probably only caught on when Assyria was overrun by Aramaic tribes. *Mêr* is known to be the Sumerian name of the weather god (see Thureau-Dangin, *Vorderasiat. Bibliothek* I, p. 255; Ebeling, *Oriental. Literaturztg.* 1913, Col. 254; Delitzsch, *Sumer. Glossar*, p. 186 etc.).

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Messerschmidt, *Keilschrifttexte aus Assur* I, p. 3 etc.). It is therefore no wonder that grocery prices are almost regularly noted in the late Babylonian astronomical texts. Naturally, in terms of the national economy, it is extremely interesting to study more closely the condition of these over the various centuries. This will, therefore, be further discussed in more detail below. Let it just be noted here that foodstuffs at the time of Nebuchadnezzar II could be regarded as extraordinarily cheap compared with later centuries. The foodstuffs mentioned in our text are the following: *šeu, suluppu, ka-si* and *šamaššammu* (see line 11). It is known that *šeu* means "barley", *suluppu* "dates" and *šamaššammu* "sesame"; but *ka-si* will be none other than the well-known *kasû* = Gk. κασία, Lat. casia "cinnamon" (see Langdon, *Proceed. Of the Soc. Of Bibl. Archaeol.* 1914, p. 192f.). The recorded quantities of foodstuffs were available for 1 shekel of silver; at the end we should add: *ana 1 šiḳil kaspi ibšû* (see *Zeitschrft f. Assyriol.* VI, p. 234, line 10; p. 235, line 29; p. 237, line 12; p. 239, line 49; p. 240, line 62).

5. *Šabâṭu 30.* Ṭebet, therefore, had 29^{d}. For *NA* as new moon observations, see above p. 40, for *SI = iltânu* see p. 46 and finally for *kiṣir maḫrû ša PA-BIL*, the comment for Rev. 2.

6. Here again, we find a new note about the water level of the Euphrates. From now on the water rises almost continuously (cf. lines 8, 13, 14, 19, 21); it is "the time of the great winter rains which saturate the soil, that fill cisterns and feed springs, mid-December to the middle or end of March" (see Benzinger, *Hebr. Archäologie*[2], p. 22).

In the following, a mistake by the Babylonian scribe is again to be noted. Venus was not below but above $\gamma + \delta$ Capricorni. Therefore, *šap* is surely to be read *e.* Both signs are, incidentally, all too easily confused on badly preserved late Babylonian tablets.

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7. As already mentioned above on p. 42, *namâru* describes the time of daybreak before sunrise. The "night", i.e. the time between sunset and sunrise, has not yet reached its end then; an observation that is taken in this period thereby still falls into "night-time". That explains the statement here: *3 UŠ mûši* = 12^m during the night-time. The counterpart to that is found in line 3: *5 UŠ ûmi* = 20^m during the daytime (time between sunrise and sunset).

8. The beginning of the line refers to the observation of the full moon. When the full moon rose, the sun had already set, hence the remark: *lâ ikaššad* "(the moon) reached (the sun) no longer". The phrase: "the full moon reached the sun" is well known from the astrological texts of Ašurbanipal's library (see Thompson, *Reports* II, p. 140: Weidner, *Beitr. z. Assyriol.* VIII, 4, p. 75); it means that both stars are in opposition on the horizon - the moon rising in the east, the sun disappearing in the west. In Šebaṭ, according to our text details, this opposition point no longer occurred as the sun had already set when the moon emerged.

For Šebaṭ 4^{th} it was noted that the water of the Euphrates begins to rise due to the extensive downpours. Here it is now mentioned that the rising of the water level from Šebaṭ 4^{th} to 15^{th} would have amounted to 1½ cubits, i.e. about 0.7425m (see above p. 44f.). From the 16^{th} on, a new drop in the water level had been observed. For *maṭû* "to drop, said of water", see Delitzsch, *Handwörterbuch*, p. 406a.

The note *mûšu 18 18* "in the night of the 18^{th} and on the 18^{th}" again shows that for the Babylonians the night preceded the day; the full day, therefore, began in the evening (see above p. 42). For *zunnu MAL* see p. 43.

9. Here we find an exceptionally interesting report about an earthquake. The earthquake is ascribed to the marching of Bêl who walks across the earth like a wolf. Since Bêl-Enlil is the god of the earth (see Jeremias, *Handbuch der altorient. Geisteskultur*, p. 237f.),

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it fully explains the fact that he is counted as the cause of the earthquake. The following details need comment: *šêpu* "foot" is probably to be added at the end of line 8. For *ŠU=râbu* see Meissner, *Seltene assyr. Ideogramme*, No. 8382, for *râbu*=quake (said of the earth) see Thompson, *Reports* II, p. LXXXIf. and Streck, *Babyloniaca* II, p. 209ff. *UR-IDIM* is also to be read *uridimmu* in Semitic-Babylonian, according to *Cuneiform Texts* XIV, pl. 1, Col. I, 27**[1]**. At the same place in line 28 "raging, wild dog" is given as the second explanation of the ideogram *kalbu šegû.*

What shows that the wolf is meant is the fact that our constellation Lupus is called *kakkab*UR-IDIM by the Babylonians ([*The Cuneiform Inscriptions of Western Asia*, Vol.] V R[awlinson] 46, 33ab; *Cuneiform Texts* XXXIII, pl. 3, line 28, etc.). It is then also reported that in the earthquake two ships "made from first class reeds" were swept away. The Babylonian ships made out of reed bundles are well known to us from reliefs (cf. e.g. Layard, *Nineveh und Babylon*, Tablet XIII C). It's obvious that lightweight ships could easily meet with disaster during an earthquake. *SUD* is = *rêḳu* "to remove oneself" (see Meissner, *Seltene assyr. Ideogramme*, No. 5588); here Šafel, which appears not yet to be attested elsewhere, could be suitable with the meaning "make oneself removed" = "to tear, drive away". The aforementioned earthquake may well have occurred in the night of Šebaṭ 22nd. According to the subsequent wording in our text, it also continued on the day of Šebaṭ 22nd.

Earthquakes must have been common in Babylon and Assyria. At any rate, they are quite often mentioned in the astrological reports from Ašurbanipal's library. For all details, refer to Thompson, *Reports* II, p. 134b; Kugler, *Sternkunde* II, p. 116f. and Bezold, *Astronomie, Himmelsschau und Astrallehre bei den Babyloniern*, p. 56. Special mention need only be made of Thompson, *Reports* 267, 10-11,

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1 Cf. Delitzsch, *Handwörterbuch*, p. 644b; Jensen, *Kosmologie*, p. 277, note 3 and *Keilinschr. Bibliothek* VI, 1, p. 6, line 18 and note 4.

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where the earthquake is explained as the roaring of Ereškigal, the goddess of the underworld (see *Babyloniaca* VI, p. 96, note 2). It is the counterpart of the mythological depiction of our text discussed above.

10. In the night of Šebaṭ 29th, a phenomenon *A-ḪA-ḪA-HA-TUM* was observed. This must surely be a scribal error. There is a phenomenon *ha-kú*[1]*-kú-tum*, also written as *a-ku-ku-tum*. Our writer apparently wanted to combine both spellings into *a-kú-kú-tum*. Unfortunately, he wrote three *kú* instead of two, thinking of *ha-kú-kú-tum* with its three *ḪA*. There can be no doubt that this should be read as *a-kú-kú-*(*kú-*)*tum*. Which phenomenon does this denote? Weidner in *Babyloniaca* VI, p. 1ff. has tried, on the basis of extremely slim evidence, to suggest that *ḫakukutum* is the common name for dawn-light and dusk-light. Meanwhile, an almost completely preserved text, as yet unpublished, has appeared, bringing together all known sparse data about *ḫakukutum* as well as completing and essentially extending them. It is therefore reproduced here in full:

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1 Written as *ḪA.*

[**Pages 56 to 59:** The transliteration of this unpublished tablet (VAT 9417) and an English translation of the accompanying footnotes, have been omitted. Please refer to the original Neugebauer and Weidner text.]

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Translation

Obverse

1. If a *ḫakukutum* shines in Nisan, the king of the country falls.

2. If in Airu, then the country will fall away from the king.
3. If in Sivan, then there will be hostilities in the country.
4. If in Tammuz, then the land will suffer distress.
5. If in Ab, then one king will capture the other one.
6. If in Elul, then the country will fall away from the king.
7. If in Tešrit, then my army will fall.
8. If in Araḫsamna, then the country will fall away from the king.

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9. If in Kislev, then my army will fall.
10. If in Ṭebet, then the country will fall away from the king.
11. If in Šebaṭ, fall of my army.
12. If in Adar, fall of my army.

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13. A *ḫakukutum* that looks like a flare points to destruction.
14. If a *ḫakukutum* sits on the southern horizon, then the day will be cloudy.
15. If it sits on the northern horizon, approach of a hurricane.
16. If it sits on the eastern horizon, approach of a wind.
17. If it sits on the western horizon, famine among the cattle: a famine will break out.
18. If it shines in the uppermost sky, then the land will be destroyed: grow smaller.
19. If it shines low in the sky, then the rates will remain stable.
20. If it shines and the sun: the moon rises within it
21. and remains (within it), then the famine will be great, plants will sprout up.
22. If it shines and the moon appears within it, then the harvest of the country will not thrive.
23. If it bears the brightness of the sun: … [ ]
24. an eclipse will take place.
25. If it shines in the path where the moon set, famine […]
26. If it is the same in the meridian, then Šamaš will […].

Reverse

1. If a *ḫakukutum* shines and behind [ ]
2. If it occurs together with a flash of lightning, then Adad will [...]
3. If it shines, becomes clearly visible and gives a fiery glow […]
4. If *ḫakukâti* shine in the sky, then the country will […]
5. If 7 shine in the sky, then […]
6. If 7 become visible in the sky, then the gods will […] the country (?)
7. If a *ḫakukutum* becomes visible within the sky, then famine will [rage in the country (?)].

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8. If, in the month of your observation, Mercury is visible,
9. then the eclipse will not be omitted.
10. If, in the month of your observation, the moon is not seen with the sun on the 14th day,
11. then the eclipse will not be omitted on the 15th day.

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12. If, in the month of your observation, the moon reaches the sun and the moon disappears,
13. is at first not visible, but then comes yet some time has elapsed since sunset,
14. then the eclipse will not be omitted on that night.
15. If, in the month of your observation, on the 13th or 15th day
16. a southerly wind is blowing, then the eclipse will not be omitted on this day.
17. If, in the month of your observation, the 13th day, the 15th day is dark
18. or the stars are dull, then in this night
19. the eclipse will not be omitted.

20. These omens … …

21. Tablet of Nabûaḫiddin.

Edge

1. If a storm-*ḫakukutum* [ ] … and four winds will blow.

The note in our text now has to be compared to this. Here, a *ḫakukutum* shone during the night of Šebaṭ 29th; a certain characteristic of this is linked with two *bêru. Bêru* can be understood as a unit of time or distance. In the former instance 1 *bêru*=2h, in the latter instance = 30°. As has already been assumed in *Babyloniaca* VI, p. 144f., it ought to indicate distance here. In any case, this is supported by the meaning of *ḫakukutum* which we now have to establish.

Taking into account the few data about *ḫakukutum* contained in other texts (collected in *Babyloniaca* VI, p. 1ff.) we now have the following characteristics: 1. *ḫakukutum* is used in Sargon's annals and in a hymn with the meaning "Firebrand". Virolleaud, *L'Astrologie Chaldéenne, Adad* XXXIII, 42, explains it as *išâtu* "fire".[1] 2. It is visible in all months.

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[1] Also cf. Virolleaud, 2. Suppl. CVII, where *ḫakukutum* is mentioned on the Obverse, *išâtu* (= dawn-light and dusk-light, see *Zeitschrift f. Assyriol.* XXVII, p. 388ff.) is mentioned on the Reverse.

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3. It can be positioned in all areas of the sky and high as well as low in the sky. 4. Moon, sun and Saturn[1] can rise in it. 5. It "lights up" (*inappaḫ*) like the sun. 6. It is illuminated by the sun. 7. It lights up after the setting of the moon. 8. It shines like a torch. 9. It can coincide with a lightning flash. 10. It can occur repeatedly (e.g. in sevens). 11. There is a 'storm-*ḫakukutum*'. 12. The sky clouds over and a *ḫakukutum* lights up (Virolleaud, 2nd Suppl. CXVI, 4).[2] 13. It lights up in the evening[3] (Virolleaud, *Adad* XXXIII, 42 (see *Babyloniaca* VI, p. 3) and our text).

The result is certain: *ḫakukutum* denotes a (by dawn or dusk glow) reddish, illuminated bank of cloud.

Now let us apply this meaning to our text. The *ḫakukutum* became visible in the evening.[3] It can then, of course, only refer to the dusk-light and so the red clouds must have been in the west. This is what the text really suggests. As the dusk-light does not persist for hours, *bêru* can only be further understood as a unit of distance. *Ḫakukutum* in our text will, therefore, be a roughly 60° high cloud bank lying on the western horizon and illuminated by the dusk's red glow.

11. Here again we find recorded the grain prices for the last month. Meanwhile, barley has increased in price because 1 silver shekel buys you 1 GUR.

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[1] Virolleaud, *Adad* XXXIII, 44, mentions the appearance of the planet Saturn in the *ḫakukutum*; *kakkab*LU-BAD SAG-UŠ of course is only an explanatory phrase there for *kakkab*ŠIB-ZI-AN-NA (contra

Babyloniaca VI, p. 3ff.), cf. 2nd Suppl. LXVI, Obv. 9.

2 The previous line says that the sky clouded over and the clouds were red (*sa-am*). This means, therefore, morning and evening phenomena.

3 In any case, *mûšu* does not mean the actual night, but the evening, as can be concluded with reasonable certainty from Virolleaud, *Adad* XXXIII, 41. "Night" for the Babylonians began, in fact, with sunset.

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The price of dates has stayed the same, as probably cassia has too. The note on sesame in line 4 had been lost.

12. *Adaru 1.* Consequently, Šebaṭ had 30d. The further astronomical technical terms of this line have already been explained above. It only needs to be emphasized that here we find the full form *arkat* instead of the usual abbreviation *ár* "behind".

13. Under Šebaṭ 16th it had been noted that the Euphrates water level was beginning to drop. According to line 13 it rose again on Adar 1st which by Adar 5th, according to line 14, amounted to 8 fingers = 0.165 m. On Adar 6th, the water level was seen to fall again.

15. The halo around the moon was "opened in the south", i.e. broken at the bottom. The astronomical texts often talk about broken halos (cf. Kugler, *Sternkunde* I, p. 78), even more frequently in the astrological texts from Ašurbanipal's library (see Virolleaud, *L'Astrologie Chaldéenne, Sin* X. XXIV, 59ff.; 1st Suppl. XXI. XLV; 2nd Suppl. XIV. XV; Thompson, *Reports* 179, 2, etc.). The opening in the halo is called *bâbu* "gate" (see references just mentioned), of a broken halo it is said: *tarbaṣu ul ḳaṣru (ḳaṣir, iḳṣur)* "the halo is not closed" (cf. Thompson, *Reports* 95, 3; 96, 5; 112, 3, etc.).

Inside the halo the moon stood 1 cubit in front of the star whose name the scribe could not decipher on the original text. Therefore, he wrote: *ḫi-bi* "broken off". As the calculation shows, this can only be Regulus. Then the text would be supplemented: *Sin ina pân Šarri izzaz.*

16. On *ŠU* = *irrup* see above, p. 42.

DAR-PA is certainly to be understood as a unit of time. It must refer to evening time. For this we already know the following terms: *ḳizîgu* (*ḲI-ZIG*)**1** = late afternoon, *ME*

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1 Cf. Virolleaud, *Babyloniaca* I, p. 50. The word is still found e.g. in the following places: *Babyloniaca* VI, p. 76; *Zeitschrift f. Assyriol.* VI, p. 235, 17; 237, 7; 241, 72; Virolleaud, *L'Astrologie Chaldéenne*, 2nd Suppl. LXIII, Col. IV, 21. 23: VAT 5047, Rev. 3, etc.

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= end of the day (time directly before sunset, see above, p. 43), *šimêtan* = evening (time directly after sunset), *rêš mûši* = beginning of the night (onset of complete darkness). *DAR-PA* can only mean the time of sunset itself. The primary support for this is that usually *DAR* = *burrumu* "colourful" (see Brünnow, *List*, No. 3485): but the wondrous displays of colour in the sky are, of course, observed precisely at sunset. Moreover, the main meaning of *PA* is "to throw down" (*maḫâṣu*); now, as is well known, sunset is described as the time when "the night throws down the glory of the

day" (cf. Virolleaud, *L'Astrologie Chaldéenne*, *Adad* XXXIII, 42; 2nd Suppl. CVI, 15, etc.). Finally, it is obvious from the second half of the line that the time described as *ME* precedes that described as *DAR-PA.* Equating *DAR-PA* = time of sunset accordingly seems to be fairly certain.

zunnu I. What kind of rain is meant cannot be determined with certainty as long as the exact meaning of *I* here is unknown. At least, however, VAT 4936 can be drawn upon for comparision, where *DIR-AN-ZA*, *DIR-AḪ-AN-ZA* and *DIR-AḪ-I-AN-ZA* are mentioned as different kinds of clouds. One may also point to VAT 4924 where, for example, lines 2 and 6 say: *mûšu 9 ḳabal Sin ina pân AN ⅔ SI I Sin ana URU SIK* and *mûšu 7 Sin ina pân AN ⅔ U I Sin ana SI NUM.*

17. The end of the line is still not readily understandable to us. Only two parallel passages should be pointed out provisionally here, which could be useful as a supplement or explanation: 1. *Zeitschrift f. Assyriol.* VI, p. 235, line 16: *ŠI KÚR 10 UŠ NA in 11 ŠI*; 2. ibid, line 25: *ŠI KÚR NUM A 17 NA in 19 ŠI* (cp. also Epping-Strassmaier, ibid. VII, p. 230f.).

18. In this line the scribe again could not read a sign in the original: "western star of the constellation x." Computation shows that it involves the star λ Aquarii which, unfortunately though,

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is not mentioned anywhere else in previously published texts. The question of how to fill in the missing constellation name is, therefore, quite difficult to answer. Now, λ Aquarii should be the most westerly (brighter) star of the constellation concerned. Now, east of λ Aquarii there are still only a few faint stars of Aquarius, yet the western boundary of the zodiac's southern Pisces is in close proximity. Therefore, we may deem it equally possible that, for the Babylonians, the zodiac's southern Pisces, *kakkab*ŠIM-MAḪ, extended further westwards, hence mainly consisting of the stars λ, φ, χ, ψ, Aquarii, β, γ, θ, ι, λ, ω Piscium. If that is correct, then *ŠIM-MAḪ* would be inserted for *ḫi-bi.*

20. The beginning of the line is incomprehensible to us. However, for comparison, we may well draw upon *Zeitschrift f. Assyriol.* VI, p. 230, line 26f.: *4a-an namrûtipl ša PA ša ana ZA MAŠ LU 3 Ú ina SI NUM.* It is, in any case, dealing with a planetary observation, as the following words then also demonstrate: "towards the end of the month it (the planet) set off to the west" (beginning of retrogradation).[1]

21. The beginning of the line again provides a note on the water level. For Adar 6th in line 14, it had been reported that the water level began to drop. On Adar 21st, a rise had been observed (line 19). Now, it is reported here that, by the end of the month, the level of the Euphrates has risen by 8 Fingers = 0.165 m.[2] There should not be any doubt that *LALiš* is to be taken as *utarriiš* (see Brünnow, *List*, No. 10115).

At the end, there is finally another mention of a curious event in Borsippa. A *barbaru* broke in, killed two dogs and was itself finally brought down. It is no longer disputed today that the *barbaru* is a sizeable predator. Jenson's[3] proposed identification with a leopard in his *Kosmologie*,

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[1] See Kugler, *Sternkunde* I, p. 273b.

[2] It is very unlikely that at the end of line 20 an entry could have been in cubits. The short period of time argues against it; cp. line 14!
[3] Even before him Lenormant and Smith.

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p. 444f., has become generally accepted (cf. Meissner, *Assyr. Jagden* [*Der Alte Orient* XIII, 2], 6; Hunger, *Babylonische Tieromina*, p. 37, note 3, etc.).

22. This catch-line gives the first line of the next tablet which dealt with the year -566/65. It proves that our tablet belonged to a larger continuous series which an astronomer of the late period had probably set up for theoretical purposes (see already above, p. 38f.). From it we can infer the important fact that Adar had 29^d. Furthermore, it was overcast on Nisan 1^{st} and hence all observation was impossible.

On the lower and left edge, the year dealt with by our tablet is added for the convenience of the collection's user.

II. Astronomical Analysis of the Text.

Corresponding dates.

Nebuchadnezzar,	Year	36,	Adar II 1	-567 March 24/25
"	"	37,	Nisan 1	-567 April 22/23
"	"	37,	Airu 1	-567 May 22/23
"	"	37,	Sivan 1	-567 June 20/21
"	"	37,	Ṭebet 1	-566 January 14/15
"	"	37,	Šebaṭ 1	-566 February 12/13
"	"	37,	Adar 1	-566 March 14/15
"	"	38,	Nisan 1	-566 April 12/13

The following examination takes into account all astronomical data preserved intact. The completion of missing sections was avoided; such sections were only examined if special reasons existed. The details about lunar halos were not considered as these were without particular astronomical interest, and were only rarely consulted for proving the correctness of dating.

All times are Babylon Mean Time; for risings and settings, the polar altitude is assumed to be +32°.5. The conversion of stellar positions into longitude and latitude

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was made with a rough conversion table, with the result that these positions could be off up to ±0°.2. Some other stellar locations, determined only approximately, have been clearly described as such.

The choice of hour for which the calculation is made is, in many cases, prescribed with sufficient precision by the visibility conditions in the relevant area of sky.

Furthermore, the time was determined according to the rough details of the text (evening = time of dusk, beginning of night = the time after dusk ends, etc.). Significant uncertainty only occurs with the fast-moving moon. For planets, an error of several hours is without any consequence.

A. The Lunar Observations.

1. On Nisan 1st the moon became visible behind the Hyades (Obv. 1).

New moon -567, April 21, 5:00 p.m. The moon becomes visible on the following evening.

April 22, 7:00 p.m.:

Moon	$\lambda = 40°.2$	$\beta = -3°.8$
Hyades	$\lambda = 32°.2$	$\beta = -6°.0$

2. At the beginning of the night of the 8th (Nisan) the moon 1 cubit in front of the star at the rear foot of the Lion (Obv. 3).

April 29, 8:00 p.m.:

Moon	$\lambda = 139°.3$	$\beta = +4°.0$
β Virginis	$\lambda = 141°.0$	$\beta = +0°.5$

Surely Nisan 8(!)th is to be read here (see above p. 41). If one retains Nisan 9th, then the detail fits γ Virginis. However, this star is described differently, as No. 6 indicates. On *kakkabšêpu ár ša UR-A* = β Virginis, see Epping, *Astronomisches aus Babylon*, p. 128.

3. On the 14th (Nisan), the god was seen with the god (= full moon, see p. 42); 16m went by between sunrise and moonset on the next morning (Obv. 4).

Nisan 14th began the evening of May 5; Full moon May 6, 8:00 a.m.

May 6, a.m.: sunrise to moonset = 12m

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4. On Airu 1st the moon became visible while the sun still stood there, 4 cubits below the western, rear stars of the Great Twins; it was wide (Obv. 8).

New moon, May 20/21 midnight. As Nisan had lasted 30d (see above p. 45), then Airu 1st only begins on the evening of May 22. The new lunar crescent, therefore, only became visible late, for which the note "the moon was wide" is perfectly fitting.

May 22, 7:00 p.m.:

Moon	$\lambda = 79°.1$	$\beta = -0°.6$
β Geminorum	$\lambda = 77°.9$	$\beta = +6°.6$

On ^{kakkab}*KÚR arkû ša MAŠ-TAB-GAL* = β Geminorum, see Epping, *Astronomisches aus Babylon*, p. 125.

5. On Sivan 1st, the moon became visible behind Cancer: it was wide, its duration of visibility after sunset amounted to 1^h 20^m (Obv. 12).

New moon, June 19, 6:00 a.m. Airu lasted for 29^d, therefore, Sivan 1st begins the evening of June 20. The note "the moon was wide" fits this late date (see previously on No. 4).

June 20, 7:00 p.m.:

Moon	λ = 102°.0	β = +1°.5
ε Cancri	λ = 91°.7	β = +1°.0

Sunset 7^h.00 [7:00 p.m.], moonset 8^h.53 [8:32 p.m.]; the time interval between sunset and moonset 1^h 32^m.

6. At the beginning of the night of the 5th (Sivan), the moon overtook by 1 cubit the northern star at the end of the Lion's foot towards the east (Obv. 14).

June 24, 8:00 p.m.:

Moon	λ = 157°.1	β = +5°.0
γ Virginis	λ = 154°.8	β = +3°.0

The comparison, ^{kakkab}*SI ša ḳît šêpi UR-A* = γ Virginis cannot, astronomically, be criticised in any way. Now let us just look at the star chart. The Babylonians regard β Virginis as "foot of the Lion", how then can γ Virginis, a star situated almost 15°

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away from β lie at the end of the foot? Surely the foot would be of monstrous size, and the figure of the Lion would look quite grotesque.[1] So it can be assumed that the Babylonian made a mistake here in describing the star. γ Virginis otherwise also bears the name *šur-ši eššêni* "root of the ear (of grain)" (see Epping, *Astronomisches aus Babylon*, p. 128).

7. On the evening of the night of the 8th (Sivan), the moon was 2½ cubits below the northern star of Libra (Obv. 15).

June 27, 8:00 p.m.:

Moon	λ = 194°.2	β = +5°.0
β Librae	λ = 193°.7	β = +8°.8

*kakkab*Zibanîtu ša SI = β Librae, see Epping, *Astronomisches aus Babylon*, p. 130.

8. On the evening of the night of the 10th (Sivan), the moon was balanced 3½ cubits above Antares (Obv. 16).

June 29, 8:00 p.m.:

Moon	λ = 217°.9	β = +3°.9
Antares	λ = 214°.1	β = -4°.2

On *kakkab*Ḫurru = Antares see Epping, *Astronomisches aus Babylon*, p. 131; Kugler, *Sternkunde* I, p. 260f.

9. On the 15th (Sivan) the god was seen with the god (= full moon, see above p. 42). 30m time between sunrise and moonset on the next morning (Obv. 17).

Full moon July 4, 1:00 p.m. Sivan 15th begins the evening of July 4.

July 5, a.m.: sunrise to moonset = 29m.

10. On the 15th (Sivan) lunar eclipse, invisible in Babylon (Obv. 17).

Eclipse July 4. As the full moon occurred soon after midday, the eclipse could not be visible in Babylon. The note on it means that, even back then, an eclipse cycle was known. (see above p. 50).

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1 Even in the Babylonian depictions of the Lion, the foot is not of any special size (see Jeremias, *Handbuch der altorient. Geisteskultur*, p. 42 and 247).

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11. On Šebaṭ 1st, the moon became visible in southern Pisces of the Zodiac. 58m duration of visibility after sunset (Rev. 5).

New moon -566 February 11, 8:00 a.m. Šebaṭ 1st begins the evening of February 12.

-566 February 12, 6:00 p.m.:

Moon	λ = 334°.0	β = -5°.0
S. Pisces	λ = 318°	β = +7°

The western part of Pisces bordering on Aquarius limited by the stars ω, θ, β, γ, λ Piscium is found in α = 350°, δ = +3° (1900). The approximate location for -567 is λ = 318°, β = +7°.

Sunset 5h.66 [5:40 p.m.], moonset 6h.86 [6:52 p.m.]; time interval between sunset and moonset 72m.

On *kakkab*ŠIM-MAḪ = S. Pisces of the Zodiac see Weidner, *Alter und Bedeutung der babylon. Astronomie*, p. 43ff. and below p. 85.

12. On Šebaṭ x, Regulus was balanced 1 cubit below the moon (Rev. 7).

Šebaṭ 11th = February 22, 8:00 p.m.:

Moon	λ = 114°.1	β = +3°.2
Regulus	λ = 114°.3	β = +0°.5

On *kakkab Šarru* = Regulus see Epping, *Astronomisches aus Babylon*, p. 127.

13. [On Šebaṭ 15th, full moon] 28m time between sunrise and moonset on the next morning (Rev. 7f.).

Full moon February 25, 9:00 a.m. Šebaṭ 15th begins the evening of February 26. The note about the duration of visibility must be an error as the following calculation shows:

February 27, a.m.: sunrise to moonset = 84m.

Here again, we likely have a scribal error. If we read 17 (*UŠ*), i.e. 68m therefore, instead of 7 (*UŠ*)

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we obtain a value that comes exceptionally close to that of the text. The correction, then, may be justified.

14. On Adar 1st, the moon became visible behind Aries while the sun still stood there. 1h 40m was its duration of visibility after sunset (Rev. 12).

New moon March 12, 10:00 p.m. Adar 1st begins on the evening of March 14. The moon was wide enough (c. 44h old) to be discerned in the upright position of the ecliptic at this time in sunshine.

March 14, 6:00 p.m.:

Moon	λ = 10°.4	β = -4°.4
α Arietis	λ = 2°.0	β = +9°.9

Sunset 6h.07 [6:04 p.m.], moonset 7h.80 [7:48 p.m.]; time between sunset and moonset 1h 44m.

On *kakkab KU-MAL* = Aries see Epping, *Astronomisches aus Babylon*, p. 119; Kugler, *Sternkunde* I, p. 260.

15. On the evening of the night of the 2nd (Adar), the moon was balanced 4 cubits below the Pleiades (Rev. 13).

March 15, 6:00 p.m.:

Moon	λ = 24°.4	β = -3°.7
Pleiades	λ = 24°.4	β = +3°.9

On *kakkab Zappu* = Pleiades see Epping, *Astronomisches aus Babylon*, p. 120.

16. On the night of x (Adar), the moon was surrounded by a halo. The halo

surrounded Cancer and Leo, it was open toward the south. In the halo, the moon stood 1 cubit in front of [broken off]. The moon 1 cubit toward the east (Rev. 14f.).

Adar 8th = March 21, 10:00 p.m.:

Moon	λ = 111°.3	β = +3°.3
Regulus	λ = 114°.3	β = +0°.5

The star, whose name is broken off, is certainly Regulus. The date is beyond question, as only with this lunar position can Cancer and Leo be within the moon's halo (radius 22°).

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This is also confirmed by the note on Adar 7th: "the moon was surrounded by a halo, Cancer and Regulus stood within it" (Rev. 14). Adar 7th = March 20. At 10:00 p.m., the moon was at a longitude of c. 97°. Regulus, then, is located near the edge of the halo, while the eastern part of Leo lies outside.

17. Towards the evening of the 12th, the god was seen with the god (= full moon, see p. 42); 6m time between sunrise and moonset on the next morning (Rev. 16).

Full moon March 26, 9:00 p.m. Adar 12th begins the evening of March 25 (this point in time is being dealt with here, as clearly indicated by line 16). March 26 a.m., moonset and sunrise at the same time.

B. Planetary Observations.

18. On Nisan 1st, Saturn opposite Pisces of the Zodiac (Obv. 2).

-567 April 22, midday:

Saturn	λ = 325°.9	β = -1°.9
S. Pisces	λ = 318°	β = +7° (cp. No. 11)

19. On Nisan 11th or 12th Jupiter rises *ana ME-*  *-šú* (Obv. 4).

The expression: "Jupiter rises *ana ME-*  *-šú*" allows for two interpretations:

a) Jupiter in opposition to the sun. Opposition falls within the period Nisan 15th-16th. The term for opposition, however, is otherwise *ME-E-A* (see p. 42).
b) Jupiter rises apparently acronychally. If one assumes a 5° arc of visibility due to the highly significant brightness of Jupiter at this time, then it follows that the sun's longitude, at the time of the acronychal rising, is 34°. This corresponds to Nisan 11th. Accordingly, the comparison *ME-*  = apparent acronychal rising seems to be assured (also see above p. 41f.).

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20. On Airu 1st, Saturn opposite southern Pisces of the Zodiac (Obv. 9).

May 22, midday:

Saturn	λ = 327°.9	β = -2°.0
S. Pisces	λ = 318°	β = +7°

21. On Airu 2nd, Venus rose *ana ŠU* (Obv. 10).
Venus has been an evening star for c. 4 months and is c. 45d ahead of its greatest eastern elongation. Therefore, the expression appears to imply that Venus is moving to its greatest elongation as an evening star (also cf. above p. 46).

22. On Airu 3rd, Mars entered into the *Nangaru*, on the 5th it came out again (Obv. 10).

May 24	12:00 a.m.	Mars	λ = 90°.2	β = +1°.3
26			91°.4	+1°.3
		Praesepe	λ = 91°.7	β = +1°.0

Praesepe's position is given as ε Cancri. ε Cancri is in the eastern part of Praesepe. The match is so outstanding, that the new, important correspondence *Nangaru* = Praesepe can be regarded as certain.

23. On the 10th (Airu), Mercury rose in the evening … heliacally behind the … Twins (Obv. 10).
Airu 10th = May 31 is given as the earliest date for Mercury's appearance (longitudinal distance from the sun = 10° geocentric).
May 31, midday:

Mercury	λ = 71°.9	β = +1°.8
ζ Geminorum	λ = 69°.2	β = -2°.4
δ "	λ = 72°.8	β = -0°.4

For the Babylonians, ζ and δ Geminorum counted as the Little Twins (see above p. 47). These might be the ones concerned here. True, Mars [*sic*] only stands behind ζ Gemin., but a precise observation was probably not possible in the pale, morning [*sic*] light and due to Mercury's short longitudinal distance from the sun. At any rate,

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neither the Great Twins nor the "Twins of Orion" (see above p. 47) can be meant, as Mercury rose almost 5° in front of α + β Gemin., while ε + γ Gemin. were about 8° away to the west and, in addition, had set heliacally.

24. On the 18th (Airu), Venus 1 cubit 4 fingers above Regulus (Obv. 11).
June 8, 7:00 p.m.:

Venus	λ = 113°.8	β = +1°.8
Regulus	λ = 114°.3	β = +0°.5

25. On Sivan 1st, Mars and Mercury 4 cubits in front of ……..; Mercury moves below Mars further to the east (Obv. 12f.).

June 20, midday:

Mercury	λ = 160°.0 [*sic*]	β = +0°.9
Mars	λ = 106°.7	β = +1°.2

June 21, midday:

Mercury	λ = 107°.4	β = +0°.8
Mars	λ = 107°.3	β = +1°.2

The text's details are confirmed. The star, in front of which both planets stood on the evening of June 20, is in any case Regulus, λ = 114°.3, β = +0°.5 (distance in longitude c. 7°.7).

26. On Sivan 1st, Jupiter above Antares (Obv. 13).

June 20, midday:

Jupiter	λ = 214°.8	β = +0°.9
Antares	λ = 214°.1	β = -4°.2

27. On Sivan 1st, Venus opposite the tail of the Lion (Obv. 13).

June 20, 8:00 p.m.:

Venus	λ = 126°.6	β = +1°.2
θ Leonis	λ = 127°.6	β = +9°.6

On *kakkab iš zibbat UR-A* = θ Leonis see Epping-Strassmaier, *Zeitschrift f. Assyriol.* VII, p. 225.

28. On the 12th (Sivan) Mars ⅔ cubit above …… (Obv. 16).

July 1, 6:00 p.m.:

Mars	λ = 113°.8	β = +1°.2
Regulus	λ = 114°.3	β = +0°.5

29. On the 19th (Ṭebet), Venus 2½ cubits below the middle star of Capricorn's horn (Rev. 3).

-566 February 1, 6:00 a.m.:

Venus	λ = 268°.2	β = +0°.8
β Capricorni	λ = 268°.4	β = +4°.8

β Capricorni is the middle star of the group α_1 α_2 - β - ο π ρ. It was already well known that the Babylonians designated these as the horn of Capricorn (see Epping, *Astronomisches aus Babylon*, p. 132).

30. On Šebaṭ 1st, Jupiter behind the front star cluster of Sagittarius (Rev. 5).

February 12, midday:

Jupiter	λ = 252°.3	β = +0°.3
ξ Sagittarii	λ = 247°.8	β = +2°.0
ο "	λ = 249°.3	β = +1°.2
π "	λ = 250°.6	β = +1°.7

The front star cluster of Sagittarius is, therefore, identical with the star cluster at Sagittarius' head, whose brightest stars are ξ, ο, π Sagittarii (also see above p. 50f.).

31. On the 4th (Šebaṭ), Venus was balanced ½ cubit above(!) the Goat-Fish (Rev. 6).

February 16, 6:00 a.m.:

Venus	λ = 286°.2	β = 0°.0
γ Capricorni	λ = 286°.0	β = -2°.4
δ "	λ = 287°.7	β = -2°.2

On *kakkab*SUḪUR-MÁŠ (fishtail of Capricornus) = γ + δ Capricorni, see Epping, *Astronomisches aus Babylon*, p. 132f.

32. Around the 20th (Adar), Venus and Mercury entered into the band of southern Pisces of the Zodiac – around the 26th (Adar), Mercury and Venus came out of the band of northern Pisces of the Zodiac (Rev. 19f).

-566 April 2, 6:00 a.m.:

Mercury	λ = 338°.7	β = -2°.6
Venus	λ = 340°.7	β = -1°.5

April 8, 6:00 a.m.:

Mercury	λ = 345°.7	β = -2°.8
Venus	λ = 348°.0	β = -1°.6

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The rough positions for the beginning and end of the band connecting both Fishes are:

Beginning of the band:	λ = 328°	β = 0
End of the band:	λ = 348°	β = 0

C. Examination of dubious text data.

33. On the ….. (Šebaṭ) ….. was balanced above the small star which is 3½ cubits behind Capricorn's fishtail (Rev. 10).

One can identify the star as ι Aquarii with near certainty, λ = 292°.6 β = -0°.7 (approximated!). According to the area of the sky, it has to do with observations toward the end of the night where the moon and Mars may be involved.

-566 Šebaṭ 23	March 7	6:00 a.m.	Moon	λ = 273°.4	β = -1°.8
24	8			285°.5	-2°.8
25	9			297°.8	-3°.8
26	10			-	-
27	11			-	-
28	12			-	-

-566 Šebaṭ 23	March 7	6:00 a.m.	Mars	λ = 288°.9	β = -1°.0
24	8			289°.7	-1°.0
25	9			290°.4	-1°.0
26	10			291°.2	-1°.1
27	11			292°.0	-1°.1
28	12			292°.8	-1°.1

As will be shown in the Appendix under a), the expression "was balanced" is probably to be interpreted as "lies in the same longitude". The moon's positions, therefore, cannot be harmonised with the text. However, the insertion

On Šebaṭ 28th Mars

would offer a satisfactory explanation. Mars does indeed lie south of the small star ι Aquarii. But as

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we previously already established an error with "above and "below" (see No. 31 and above p. 52), the case here may well be similar too. Instead of "above", in all likelihood "below" should be entered. Further on this, cf. above p. 52.

Other planets are out of the question:

March 7,	6:00 a.m.	Mercury	λ = 334°	Venus	λ = 309°
15,			330°		319°
March 7,	6:00 a.m.	Jupiter	λ = 255°	Saturn	λ = 332°

34. On the ….. Adar a planet in front of the band of southern Pisces of the Zodiac, ½ cubit below Venus; Mercury stood 8 fingers further towards the east …. On …. Adar a planet 6 fingers above Mercury, it was balanced ⅔ cubit below Venus, and Mars was balanced ⅔ cubit below the western star of the broken off (Rev. 17f.).

The planetary positions for Adar's period in question (10th-20th) are:

			Mercury		Venus	
			λ	β	λ	β
-566 Adar 9	March 23	6:00 a.m.	331°.1	-1°.3	328°.6	-1°.4
11	25		332°.2	-1°.6	331°.0	-1°.4
13	27		333°.5	-1°.9	333°.4	-1°.4
15	29		335°.0	-2°.2	335°.9	-1°.4
17	31		336°.7	-2°.4	338°.3	-1°.4
19	April 2		338°.6	-2°.6	340°.7	-1°.5

			Saturn		Mars	
			λ	β	λ	β
-566 Adar 9	March 23	6:00 a.m.	334°.5	-2°.0	301°.1	-1°.3
11	25				302°.6	
13	27		335°.0	-2°.0	304°.1	-1°.3
15	29				305°.7	
17	31		335°.5	-2°.0	307°.2	-1°.4
19	April 2				308°.7	

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Jupiter is not an option (λ = 256°).

The positions cannot be explained unequivocally. Saturn seems to be meant for both.

Adar 14th, March 28, 6:00 a.m.:

Saturn	λ = 335°.1	β = -2°.0
Venus	λ = 334°.7	β = -1°.5

Band of southern Pisces: approx. 328° - approx. 348°.

Adar 15th, March 29, 6:00 a.m.:

Venus	λ = 335°.9	β = -1°.4
Saturn	λ = 335°.2	β = -2°.0
Mercury	λ = 335°.0	β = -2°.2

Furthermore:

Mars	λ = 305°.7	β = -1°.3
λ Aquarii	λ = 305°.9	β = -0°.4

D. Year Markers.

35. On the 9th (Sivan), summer solstice (Obv. 16).

Sivan 9th = -567 June 28/29. The summer solstice takes place -567 June 29, 4:00 p.m.

E. Appendix

a) Examination of the expression "was balanced".

The expression occurs in No. 8, 12, 15, 24, 31 (and 33). The uncertain place 34 has been left out.

In five cases the longitudes are the same; in one of them, different. No rule can be recognised in the latitudinal position, with the result that we can provisionally presume the following to be likely:

"In balance" means "lies in the same longitude."

The same conclusion was reached by Kugler, *Sternkunde*, *Ergänzungsheft*, p. 128.

b) Determination of the length of the cubit.

Epping, *Astronomisches aus Babylon*, p. 118 ascertained the length of the cubit to be 2°.3 from data in the texts available to him; Kugler, *Zeitschrift f. Assyriol.* XV, p. 383ff.

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calculated it to be 2°.5 with the same methods. From our text a new value can now be determined for the cubit.

Because of the uncertainty in the times given, fortunately the more numerous latitudinal differences are more valuable in calculating the cubit than the longitudinal differences, as the latter are greatly influenced by incorrect assumptions about time.

Latitudinal differences are given in No. 4, 7, 8, 12, 15, 24, 28, 29, 31. If one discounts the exaggeratedly large value of No. 31 (4°.8!), one arrives at the average:

1 cubit = 1°.8.

Among the longitudinal differences No. 2, 6, 16, 25, No. 16 is uncertain due to insufficient knowledge of the precise hour. If one excludes it, the three remaining ones yield:

1 cubit = 2°.0.

The average of all calculations, including No. 16 and 31, is:

1 cubit = 2°.1.

It would be of utmost importance to test this result on other texts. It should be further noted that, in the study of the dubious positions in C, 2° was adopted as the value of the cubit.

So if we take the cubit to be 2°, which is most likely, then we arrive at the following table[1]:

Ecliptic =	12 bêru =	360°
1 bêru =	15 ammatu =	30°
1 ammatu =	24 ubânu =	2°.0
1 ubânu =	5′	

If that is correct, then the often used unit of longitude *UŠ* would be exactly double the cubit, whereas for Epping's and Kugler's value of the cubit no connection between the two is possible.

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[1] These results only relate to the present text; it would be worthy of investigation whether the differing results of Epping and Kugler do not indicate a change in the unit of measure.

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III. Results.

1. Moon, sun and planets.

The main focus of attention for the Babylonian astronomers was the moon (*Sin*); indeed, the moon god Sin even regularly played the key role in Babylonian religion (cf. Jeremias, *Handbuch der altorient. Geisteskultur*, p. 240ff.). As the Babylonians had a lunar year, the beginning of the new month depended on the illumination of the new moon (Obv. 1, 8, 12; Rev. 5, 12). Therefore, it is understandable that this was observed with particular care. Above all, they noted the duration of crescent visibility after sunset (Obv. 1, 12; Rev. 5, 12), recorded whether the crescent was

already quite wide in case the date of the astronomical new moon already occurred a long time ago (Obv. 8, 12) and diligently pointed out the appearance of earthshine (Obv. 8; Rev. 12). During the course of the month, the position of the moon relative to the brighter zodiacal stars is then noted (Obv. 2, 3, 14, 15, 16; Rev. 7, 13, 15). The date of the full moon was again given special importance (Obv. 4, 17; Rev. 16). Both moon and sun here appear under the simple name *ilu* "god" (see above, p. 42). Here again, it is carefully recorded how long after sunrise the full moon was still visible the next morning (Obv. 4, 17; Rev. 8, 16). At this time, a possible lunar eclipse must have also occurred. However, the one of July 4, -567 was not visible in Babylon (Obv. 17). Last crescent visibility is mentioned in Obv. 11. It says there that the moon was still visible on Airu 26th and then on the 27th (as can likely be supplemented) disappeared in the sunlight. It should also be mentioned that there is often some discussion of lunar halos (Rev. 6, 7, 14).

The sun (*Šamaš*) is mentioned comparatively rarely. Its position relative to the new moon crescent (Obv. 4; Rev. 12) and to the full moon (Obv. 4, 17; Rev. 16) is noted. In the latter instance, it is simply called *ilu* like the moon. Even the sun's four year markers were carefully observed;

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our text only preserves the note on the summer solstice (Obv. 16). Solar halos are mentioned in Obv. 3, 5; Rev, 3, 8.

The planet Mercury is called *GÙ-UD.* Under Airu 1st, it is reported that it had not been visible as it was in superior conjunction with the sun (Obv. 9); under Airu 10th, that it had risen heliacally behind the Little Twins (Obv. 10). At the beginning of Sivan, it was in conjunction with Mars (Obv. 12f.); in the middle of Adar, in conjunction with Venus and Saturn (Rev. 17ff.). Obv. 12 and Rev. 17ff. report on its position relative to the fixed stars.

Venus (*DIL-BAT*) is often mentioned. By far the majority of cases deal with its position relative to the zodiacal stars (Obv. 11, 13; Rev. 3, 6, 17ff.). According to Obv. 10, at the beginning of Sivan it approached its greatest elongation as the evening star; according to Rev. 17f., at the end of Adar it was in conjunction with the planets Mercury and Saturn.

The planet Mars bears the name *AN* (on this cf. Weidner, *Alter und Bedeutung der babylonischen Astronomie*, p. 12). Obv. 10, 12 and Rev. 10, 18 report on its position relative to the fixed stars. At the beginning of Sivan it was in conjunction with Saturn (Obv. 13).

Jupiter is sometimes called *SAG-ME-GAR* (Obv. 13), sometimes ^{il}*SAG-ME-GAR* (Obv. 4; Rev. 5, 12). On Sivan 1st, it stood above Antares (Obv. 13); on Šebaṭ 1st in Sagittarius (Rev. 7). Its apparent acronychal rising in the middle of Nisan is mentioned on Obv. 4.

Saturn is described once as ^{il}*SAG-UŠ* (Obv. 1), once as ^{il}*GIN.* In both cases, its name is to be read *Kaimânu* "the constant one" (due to its slow movement). Its position in southern Pisces of the Zodiac is mentioned on Nisan 1st and on Airu 1st (Obv. 2, 9); its conjunction with Mercury and Venus at the end of the month Adar on Rev. 17ff.

2. The Fixed Stars.

As the fixed stars in our text are only mentioned in connection with the moon or planets, they can naturally

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only have to do with zodiacal constellations.[1] The names of nine zodiacal signs occur throughout[2]: 1. ^{kakkab}*KU-MAL* = Aries; 2. ^{kakkab}*GÙ-AN* = Taurus; 3. ^{kakkab}*MAŠ-TAB* = Gemini; 4. ^{kakkab}*Nangaru* = Cancer; 5. ^{kakkab}*UR-A* = Leo; 6. ^{kakkab}*Zibanîtu* = Libra; 7. ^{kakkab}*PA-BIL* = Sagittarius; 8. ^{kakkab}*SUḪUR-MÁŠ* = Capricorn; 9. ^{kakkab}*ŠIM-MAḪ* and ^{kakkab}*Anunîtum* = southern and northern Pisces. In the preserved part of the text, Virgo (otherwise *ÉŠ-ŠIN*), Scorpius (otherwise *GIR-TAB*) and Aquarius (otherwise *Gu-la*) are therefore not mentioned (cf. the table in Jeremias, *Handbuch der altorient. Geisteskultur*, p. 119).

Aries (^{kakkab}*KU-MAL* "constellation of the Hired Man") is only mentioned in Rev. 12 with a new crescent observation (cf. above p. 71).

For the Babylonians, Taurus falls into three parts. The Pleiades are called ^{kakkab}*Zappu* "Star (κατ᾽ ἐξοχήν)" (Rev. 6, 13)[3], the Hyades *GÙ-AN* "Bull of Heaven" (Obv. 1; Rev. 6)[4] and β + ζ Tauri *Narkabtu* "Chariot" (Rev. 6).[5]

Of the three Twin constellations, into which the Babylonians divided our Gemini, the Great

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[1] In the section devoted to the month of Tammuz, there was probably a mention of Sirius' heliacal rising. Cf. Epping, *Astronomisches aus Babylon*, p. 150f. and Bezold, *Zenit- und Äquatorialgestirne*, p. 49.

[2] If the new crescent observations taken on the 1st day of the individual months are placed consecutively, one also arrives at the sequence of zodiacal signs: Nisan 1st: Taurus (Obv. 1), Airu 1st: Gemini (Obv. 8), Sivan 1st: Cancer (Obv. 12), Šebaṭ 1st: Pisces (Rev. 5), Adar 1st: Aries (Rev. 12).

[3] Cf. Weidner, *Alter und Bedeutung der babylonischen Astronomie*, p. 19, note 2.

[4] Probably to be read as *alû* in the Semitic (cf. Delitzsch, *Handwörterbuch*, p. 60; Meissner, *Seltene assyr. Ideogramme*, No. 4040); but also cf. [*The Cuneiform Inscriptions of Western Asia*, Vol.] II R[awlinson] 49, 3, line 45.

[5] Cf. Weidner, passim p. 51f.

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and the Little Twins are mentioned in our text. On Airu 1st, the new lunar crescent appeared behind the ^{kakkab}*KÚR arkû ša MAŠ-TAB-GAL* "the western rear star of the Great Twins" = β Gemin. (Obv. 8); on Airu 10th, Mercury rose heliacally behind the *MAŠ-TAB*-[*TUR*] "the Little Twins" (δ + ξ Gemin.) (Obv. 10, see above p. 47).

Cancer, for the Babylonians, is called ^{kakkab}*Nangaru* "constellation of the Carpenter" (Obv. 12; Rev. 7, 14, 15). Very important is the fact, newly established by our text, that this name initially applied only to Praesepe (ε Cancri) (Obv. 10, see above p. 73).[1]

The constellation of Leo is often addressed in our text; its name is ^{kakkab}*UR-A* "constellation of the Lion" (Rev. 7, 15). Of the individual stars of Leo, there is

mention of: 1. *Šarru* = "King Star"[2] = Regulus (Obv. 11; Rev. 7, 14, 15); 2. *[iš]zibbat UR-A* "tail of the Lion" = θ Leonis (Obv. 13); 3. *[kakkab]šêpu ár ša UR-A* "rear foot of the Lion" = β Virginis[3] (Obv. 3); 4. *[kakkab]SI ša ḳît šêpi UR-A* "northern star at the end of the Lion's foot" = γ Virginis (Obv. 14; but cf. above p. 68f.!);

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[1] The reading *Nangaru* and the translation "Carpenter" is in no doubt (also cf. Thureau-Dangin, *Revue d'Assyriol.* X, p. 225; incorrectly Hommel, *Aufsätze und Abhandl.*, p. 251, note 1). Thus, in the sky we find combined in one place a "Crib" (ε Cancri), a "Carpenter" (likewise ε Cancri) and two "Donkeys" (δ + λ Cancri, cf, Ideler, *Untersuchungen über den Ursprung der Sternnamen*, p. 158ff., Boll, *Sphaera*, p. 128f., etc.). The concurrence with the Christian Christmas story (Joseph as "carpenter", "crib" and ox and "donkey" in the manger) did not, of course, go unnoticed by late Christian development of legend (cf. Nork, *Der Festkalendar*, p. 746, 777; Niemojewski, *Gott Jesus* II, p. 330f.; Erbt, *Jesus. Die Entstehung des Christentums*, p. 101, etc.).

[2] Regulus, the "King Star", as the star is still called today, is naturally only one translation of *Šarru*. Cf. the Schol. Arat., V. 148, I, p. 43 (Buhle): ὁ Λέων ἔχει ἐπὶ τῆς καρδίας ἀστέρα, Βασιλίσκον λεγόμενον, ὃν οἱ Χαλδαῖοι νομίζουσιν ἄρχειν τῶν οὐρανίων (Bouché-Leclercq, *L'Astrologie greque*, p. 139, note 2).

[3] The Babylonians, therefore, had a somewhat different division for the zodiacal signs, as a part of our Virgo still belonged to Leo.

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5. *[kakkab]KÚR ša ḳît šêpi* [*UR-A*?] "eastern star at the end of the Lion's foot" = ? (Obv. 18).

The name of Libra is *[kakkab]Zibanîtu* "constellation of the Scales". In our text, only the star *Zibanîtu ša SI* "northern Scale" = β Librae is mentioned (Obv. 15).

Scorpius itself is not mentioned but only its brightest star Antares. It's called *Ḫurru* "hole"[1] (Obv. 13, 16).

Of the zodiacal sign Sagittarius (*PA-BIL*[2]), only the cluster of stars near ξ, ο, π Sagittarii is mentioned: *kiṣir maḫrû ša PA-BIL* "front star cluster of Sagittarius" (Rev. 5, see above p. 50f.). The *[kakkab]MURUB ša kiṣir maḫrû ša PA-BIL* "middle star of the front star cluster of Sagittarius" (Rev. 2) is probably ξ Sagittarii (see above p. 51).

Capricorn, for the Babylonians, appears as a goat with a fishtail, as it is still depicted on our star charts today. The front part is called *[kakkab]MÁŠ = enzu* "Goat"; the rear, *SUḪUR-MÁŠ = suḫurmašu* "Goatfish".[3] Additionally, we also find *SUḪUR ša MÁŠ* "the fish(tail) of the Goat" (Rev. 10). Our text only mentions *[kakkab]MURUB ša ḳarni MÁŠ* "the middle star of the Goat's horn" = β Capricorni (Rev. 3) and *SUḪUR-MÁŠ* = γ + δ Capricorni (Rev. 6). The small star ι Aquarii is designated as *kakkabu ṣiḫru ša 3½ Ú ár SUḪUR ša MÁŠ izzazu* "the small star which lies 3½ cubits behind the Goat's fish(tail)".

The name of Aquarius is not mentioned in our text.

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[1] It is the hole in the ground in which the Scorpion's body lies (cf. Kugler, *Sternkunde* I, p. 260f.).

[2] In the older texts, the more complete *PA-BIL-SAG*, also frequently as the god's name *[il]PA-BIL-SAG* (see Deimel, *Pantheon Babylonicum*, p. 240). Its meaning cannot be determined with certainty.

[3] Cf. Zimmern in Frank, *Bilder und Symbole*, p. 11, note. On *suḫur*-fish, see Jensen, *Kosmologie*, p. 73, note 1 (= Dolphin), Holma, *Kleine Beiträge*, p. 30ff. (= Carp) and Jensen, *Keilinschriftl. Bibliothek* VI, 2, p. 5*f. (= Seal, very unlikely!).

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We have just discussed ι Aquarii, whose celestial position has been ascertained from Capricorn. Rev. 18 mentions the star λ Aquarii. Indeed, the name of the constellation is not preserved but seems to have been counted with southern Pisces of the Zodiac (see above p. 64f.).

Finally, concerning Pisces, the text here provides the most important results. For a long time there has been a strong dispute over the identification of the stars ^{kakkab}*ŠIM-MAḪ* and ^{kakkab}*Anunîtum* (see Weidner, *Babyloniaca* VI, p. 147ff.; Kugler, *Sternkunde*, *Ergänzungsheft*, p. 11f., 162, 216f.; Bezold, *Zenit- und Äquatorialgestirne*, p. 22f.). Our text now settles the issue with unquestionable certainty: ^{kakkab}*ŠIM-MAḪ* = southern Pisces of the Zodiac (Obv. 2, 9; Rev. 5), *riksu ša ŠIM-MAḪ* = band of stars ω - ζ Piscium (Rev. 17, 19). ^{kakkab}*Anunîtum* = northern Pisces of the Zodiac (Rev. 20), *riksu ša Anunîtum* = band of stars ζ - ρ Piscium (Rev. 20): cf. already Weidner, *Alter und Bedeutung der babylonischen Astronomie*, p. 43ff. As already shown there, a considerable part of the great star list BM 86378 (*Cuneiform Texts* XXXIII, pl. 1ff.) is simply blown apart by these unassailable conclusions which in no way fit their details. It is, of course, no wonder that a good number of identifications by Kugler (*Sternkunde*, *Ergänzungsheft*) and Bezold (*Zenit- und Äquatorialgestirne*) thus prove to be highly problematic or plain wrong.

3. Meteorological Data.

Of all meteorological phenomena, we find halos are mentioned the most often. In all cases, these are the most commonly occurring halos of 22° radius (Babylonian *tarbaṣu*, see above p. 41). The halos around the sun, which our text mentions (Obv. 3, 5; Rev. 3, 8), offer nothing especially noteworthy. More important are the halos around the moon (Rev. 6, 7, 14, 15) since the constellations surrounded by the halo are always carefully listed, and thus an important aid is given for their identification.

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In particular, attention is also drawn to the lunar halo of Adar 8th which was open underneath (Rev. 15).

An overcast sky is rarely mentioned. Only on Nisan 15th and on Adar 11th and 21st does it say: *irrup* "it was cloudy" (Obv. 4; Rev. 16, 19). For Airu 15th it is noted that a long stretch of cloud lay on the horizon (Obv. 11); for Šebaṭ 29th, that in the evening a 60° high cloud bank on the western horizon could be seen lit up by the red evening glow (Rev. 10).

Also, we rarely hear of downpours. Heavy showers are mentioned twice (Obv. 5; Rev. 8), perhaps once a light drizzle(?) (Rev. 16).

The observation of a rainbow (*TIR-AN* = *marratu*) is noted for Nisan 2nd (in the morning, Obv. 2) and Nisan 20th (in the evening, Obv. 5).

The wind direction, if a wind blew at all, is carefully recorded on the 1st of the month. Each time, on Sivan 1st, Šebaṭ 1st and Adar 1st, a north wind blew (Obv. 12; Rev. 5,

12). Otherwise we only ever hear that, during the night of Airu 1st, a violent south-easterly hurricane (Obv. 9) and on Airu 2nd a strong northerly storm (Obv. 10) had been raging.

4. Geological Data.

A geological detail is presented only in Rev. 2. It says there that a violent earthquake was felt on Šebaṭ 22nd during the night and day (Rev. 9). It appears to have caused great damage; particularly the loss of two ships, made from "first-class reeds", seems to have been painfully felt.

5. Data on the Water Level of the Euphrates.

The Euphrates' water level was, and is, dependent on the time of year and the amount of rainfall. In the Near East, one differentiates between a rainless season (beginning of May to the end of October) and a rainy season (end of October to the beginning of May). The latter is divided into three parts: 1. the time of the early rains (October/November),

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2. the time of the winter rains (December-March), 3. the time of the late rains (April/May).[1] The months Airu and Sivan of Nebuchadnezzar's 37th year, then, fall within the period end of May to end of July. It is, therefore, no wonder that in the sections devoted to these months we find no water level details, as without rainfall no change (increase) in water level is possible anyway. It is different in Nisan (April/May), Šebaṭ (February/March) and Adar (March/April). Nisan is the time of the late rains. According to line 6, the water of the Euphrates rose by 1.65m from the 8th of Adar II (April 1) until the 28th of Nisan (May 18). Therefore, the amount of rainfall had been quite considerable. Šebaṭ and Adar fall in the period of the winter and late rains. Rev. 8 (also cf. Rev. 6) reports that, from Šebaṭ 4th-15th, the level of the Euphrates had risen by 0.7425m. On the 16th, a new drop in the water level was observed. On Adar 1st it started to rise again (Rev. 13), indeed by 0.165m until the 5th. A drop occurred again until, finally during the period of Adar 21st to the end of the year, the water rose by 0.165m according to the marker readings. These data are of huge value, of course, for researching the climatic conditions of ancient Babylon.[2] Moreover, as far as our text is concerned, they show that the climate in the ancient Near East was almost the same as it is in modern times.

6. Prices of Foodstuffs.

Lastly, let us conclude with a brief mention of the foodstuff prices, noted by our text for the months of Ṭebet and Šebaṭ (Rev. 4 and 11). What we find here is an important factor for evaluating the economy of ancient Babylon. We have therefore collected all relevant data

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[1] According to Benzinger, *Hebräische Archäologie*[2], p. 22.

[2] Water level data are also found in *Zeitschrift f. Assyriol.* VI, p. 234, line 11; p. 238, lines 21, 22, 25, 33, 34; p. 239, line 50; p. 240, line 52.

from astronomical texts, as far as they are published or otherwise made available to us, and recorded them in the following table[1]:

	šeu	***suluppu***	***šamaš-šammu***	***ka-si***
	ḲA	***ḲA***	***ḲA***	***ḲA***
1. -567				
Ṭebet	192	240	-	180 + x?
Šebaṭ	180	240	24	216
2. -418[2]				
Nisan	24	16½	-	144
	E.M. 23			
Airu	24	-	-	120
	M.M. 18			
Sivan	30	-	-	-
	E.M. 36			
Adar	21	10	-	90
	E.M. 22			
Adar II	25	48	-	114
3. -378[3]				
Tešrit	-	-	15	-
Araḫsamna	52½	-	-	-
4. -273[4]				
Tešrit	36	72	21	-
5. -272[5]				
Adar	36	90	15	-

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[1] The recorded quantities were available for one shekel. The following abbreviations are used in the table: B.M. = beginning of month; M.M. = middle of month; E.M. = end of month.

[2] According to VAT 4924 (unpublished).

[3] Kugler, *Sternkunde* I, Table III, No. 5, lines 2 and 12.

[4] *Zeitschrift f. Assyriol.* VI, p. 234, line 9f.

[5] Ibid., p. 235, line 28f.

	šeu	*suluppu*	*šamaš-šammu*	*ka-si*
	ḲA	*ḲA*	*ḲA*	*ḲA*
6. -232[1]				
Tešrit	B.M. 48	-	8	-
	M.M. 39			
	E.M. 36+x			
Araḫsamna	-	36	9	-
Kislev	B.M. 30	36	-	-
	M.M. 38			
	E.M. 36			
7. -231[2]				
Šebaṭ	39	-	-	-
Adar	-	-	9	-

The table shows that foodstuffs in the neo-Babylonian period were much cheaper than in the Hellenistic period. It would be interesting to investigate and test this result more closely by consulting the business documents from the same era. The results would, in any case, be of great interest for the cultural historian.

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[1] Ibid., p. 237, line 11f.; p. 238, line 23; p. 239, line 36f.

[2] Ibid., p. 240, line 61f.; p. 241, line 75.

ACKNOWLEDGEMENTS

The little astronomical tablet from Nebuchadnezzar's 37th year continues to capture the interest of both professional academics and amateurs alike. It was a pity that *the* first, detailed study of it was in German and thus could not be appreciated by the non-German speaking world. The only English translation previously available had been a typewritten version, apparently undertaken in the late 1970s at the University of Sydney, Australia. Now we are in the age of the internet, I felt it was time a quality English translation of Neugebauer and Weidner's important study was made accessible to all. This translation project has indeed been a challenge and very time-consuming. I wish to thank my dear husband, a very capable Germanist, who proofread, corrected and improved my translation. I could not have completed the project without him. Any errors that may remain are, of course, my own.

~ Ann O'Maly, December 2011.